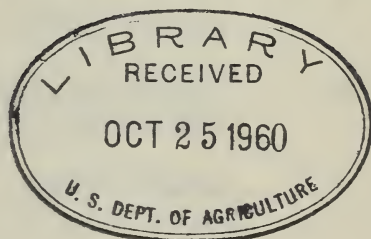


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Agricultural Research Service
UNITED STATES DEPARTMENT OF AGRICULTURE

UNITED STATES DEPARTMENT OF AGRICULTURE

² U.S. Agricultural Research Service, ^{+2a}

G. W. Irving, Jr., Deputy Administrator

^{2a}

EASTERN UTILIZATION RESEARCH
AND DEVELOPMENT DIVISION

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Unless otherwise indicated, the room numbers and telephone extensions given in this book refer to the Wyndmoor headquarters.

Washington extensions may be obtained through the switchboard by calling REpublic 7-4142, or directly by calling DUDley 8- followed by the extension number.

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OFFICE OF THE DIRECTOR

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MECHANICAL SUPERINTENDENT: *F. Macdonald*
Room 1022, Ext. 296

* South Building, Washington, D. C.

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Chief: W. C. Ault

Room 3006, Ext. 244

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Acting Head: W. S. Port

Room 2128, Ext. 251

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Isomerization.* Studies are carried out on the isomerization of double bonds of unsaturated fatty acids and derivatives from animal fats.

3. *Peroxides.* Peroxides are prepared from animal fats, and their properties, reactions, and applications are investigated.

4. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Polymerization mechanisms involved are studied, and the chemical reactions of the polymers are investigated.

5. *Structure of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: J. T. Scanlan

Room 3008, Ext. 245

1. *Halogens.* Means of introducing halogens into fatty molecules are studied, and the mechanism of the reactions involved in stabilizing materials containing polymeric halogens is investigated.

2. *Alkylene Oxides*. Alkylene oxides are reacted with suitable fatty derivatives to make lubricant additives.

3. *New Lubricants*. New and useful products in the field of lubricants and lubricant additives are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives

Detergents Investigations

Head: A. J. Stirton

Room 3104, Ext. 256

1. *New Surface-Active Products*. Surface-active compounds made from suitable animal-fat derivatives are prepared and evaluated as detergents, wetting agents, emulsifiers, and similar products.

2. *Combination Detergents*. Detergents that are more efficient, or have a combination of useful properties, are sought by combining fat-derived compounds with soaps or other surface-active materials.

Exploratory Reactions Investigations

Head: D. Swern

Room 2130, Ext. 249

1. *Activation Reactions*. Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats.

2. *Radiation-Induced Reactions*. Radiation-induced reactions are conducted on animal fats and derived fatty acids.

3. *Metalloid Derivatives*. Metalloid derivatives are prepared from animal fats and their component fatty acids.

ANIMAL FAT PROPERTIES LABORATORY

Chief: B. A. Brice

Room 1032, Ext. 226

The Animal Fat Properties Laboratory investigates the chemical composition, molecular structure, and basic physical properties of animal fats and their derivatives, and evaluates potentially useful products made from them.

Chemical Composition and Structure Investigations

Head: R. W. Riemenschneider

Room 2118, Ext. 250

1. *Analytical Methods*. New and improved methods are developed for quantitatively fractionating and determining the glycerides, fatty acids, cholesteryl esters, phospholipids, unsaponifiable constituents, and other components of animal fats.

2. *Glycerides in Shortenings.* Individual pure glycerides of known structure are synthesized or isolated from natural source so that their composition can be related to their physical character and their performance in shortenings.

3. *Deterioration of Food and Feed Fats.* The effects of deteriorative changes in lipids are studied as they relate to the utilization of fats in food and feed.

4. *Oils from Uncultivated Plants.* The epoxy fatty acids of oils obtained from uncultivated plants, which can be modified for use in plastic compositions, are isolated and their properties determined, with a view to the possible development of these plants as industrially useful replacement crops for some now in surplus.

Physical Properties Investigations

Head: H. Susi

Room 1124, Ext. 340

1. *Molecular Properties.* The molecular structure, reactions, and properties of compounds derived from animal fats are studied by spectrophotometry, X-ray diffraction, and electron microscopy.

2. *Development of Methods.* New and improved methods are devised for determining the composition and properties of animal fats and their derivatives based on absorption spectrophotometry, refractometry, X-ray, and other physical techniques.

3. *Application of New Techniques.* Such new techniques as nuclear magnetic resonance spectroscopy and mass spectrometry will be applied to investigate the composition, structure, and properties of animal fats and their derivatives.

Product Properties Evaluation Investigations

Head: L. P. Witnauer

Room 1123, Ext. 345

1. *Evaluation of New Compositions.* Compositions based on animal fats that have potential use as plastics, elastomers, plasticizers, and coatings are evaluated through studies of their mechanical properties.

2. *New Techniques.* New techniques and apparatus are developed for evaluation of products derived from animal fats.

3. *Fundamental Properties.* The fundamental physical properties and molecular structure of animal fat derivatives are studied and the results are correlated with chemical constitution to establish a basis for developing such new and useful products as plastics, plasticizers, detergents, lubricants, and stabilizers.

DAIRY PRODUCTS LABORATORY

Chief: B. H. Webb Room 1646,* Dudley 8-2365

The work of the Dairy Products Laboratory falls within four principal investigation areas. One is devoted to a study of milk concentrates and dried milks; the second to cheese and butterfat; the third to the complicated problem of retaining flavor in processed milks; and the fourth to a method for the removal of isotopes from milk.

Milk Concentrates Investigations

Head: M. J. Pallansch Room 0612,* DUDley 8-2484

1. *Chemistry of Milk Components.* The organic and physical chemistry of the protein, lipid, and sugars of milk are studied.

2. *Fat Stabilization.* Means are sought to stabilize the butterfat in concentrated milks against oxidative changes.

3. *Dry Whole Milk.* The physico-chemical effects of the drying process on whole milk are studied with a view to the development of a dried whole milk.

4. *Evaporated Milks and Frozen Concentrates.* Improved evaporated and frozen concentrated milks are developed.

Cheese and Butterfat Investigations

Head: R. P. Tittsler Room 1639,* DUDley 8-2465

1. *Cheese Cultures.* Microbiological research is directed to the control of microbiological activity in cheese and other cultured dairy products.

2. *Cheesemaking Procedures.* More economical and efficient methods of making cheese are developed.

3. *Milk in Baked Goods.* A wider use of milk in baked goods is sought by the development of such products as high-milk protein bread, and improved milks for such use are developed.

4. *Butter and Cream Research.* Butter and butter oil are being worked on to improve their stability, new butterfat products are under development, and better processes for handling and preserving butter and cream are sought through basic studies of their physical properties.

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5. *Whey Utilization.* The development of new and improved processes and products for the utilization of whey is being sought through a study of the chemical and biochemical characteristics of whey and its components.

Milk Flavor Investigations

Head: Vacancy

1. *Basic Studies on Milk Flavors.* The individual constituents of milk flavors are being isolated, purified, and identified, and the mechanism of flavor formation is being established.

2. *Flavor Stability.* Procedures are worked out to preserve desirable flavors and to prevent the formation of off-flavors.

3. *Off-Flavor Removal.* Processes are sought to remove the off-flavors that develop in both manufacturing and marketing milk.

4. *Taste Testing.* Statistically sound sensory tests are developed and correlated with objective tests so that flavor changes in milk and its products can be measured precisely.

Isotope Removal Investigations

Head: L. F. Edmondson

Dairy Products Bldg., Ext. 215*

1. *Methods of Isotope Removal.* Basic studies are made on the preferential removal of radioactive nuclides from milk.

2. *Development of a Process.* A practical plant process for removing radioactive nuclides from milk is sought.

3. *Effects of Isotope Removal.* The effect of this process on the composition, flavor, and nutritive value of milk is evaluated.

4. *Radioactivity Monitoring.* Practical plant methods are developed for the monitoring of radioactivity.

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MILK PROPERTIES LABORATORY

Chief: G. C. Nutting

Room 1030, Ext. 285

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of this work is directly related to the effects of processing on milk properties.

Biochemical Properties Investigations

Head: C. A. Zittle

Room 1100, Ext. 332

1. *Milk Enzymes.* The basic chemistry of milk enzymes is studied and methods are developed for their purification and characterization.

2. *Protein Structure.* Purified proteins are split by specific proteolytic enzymes to peptide fragments, and these fragments are studied to determine their amino acid sequence and fine structure.

3. *Reactions of Milk Proteins and Salts.* The effect of heat on milk proteins in the presence of milk salts is determined.

4. *Interaction of Components.* The interaction between the various components of milk is evaluated.

5. *Basic Studies Related to Storage of Concentrated Milks.* Better resistance of concentrated milks to fat separation and gelation on storage is sought through the development of basic information.

Physical-Chemical Properties Investigations

Head: S. N. Timasheff

Room 1125, Ext. 344

1. *Molecular-Kinetic Properties of Milk Proteins in Solution.* Such phenomena are studied as aggregation-dissociation, structural transformations, binding of small molecules and ions, and genetic differences.

2. *Inter-Molecular Forces.* The forces acting between protein and other molecules are investigated, as are the specificity of the forces and the nature of the processes that take place at particular interaction sites.

3. *Special Techniques.* Ultracentrifugal, electrophoretic, light-scattering, and radioactive-tracer techniques are applied in collaboration with other investigations groups within the Division.

4. *Macromolecular Studies.* Thermodynamics and statistical mechanics of macromolecules are studied.

MEAT LABORATORY

Chief: W. L. Sulzbacher

Building 200, Ext. 394*

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and at developing better methods of handling, preserving, and processing meats. These investigations are carried out in the areas of composition and quality, product stability, and microbiology.

Composition and Quality Investigations

Head: C. E. Swift

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats to obtain products with more desirable qualities, including nutritive value, and to secure the optimum utilization of meats from all commercial grades and cuts.

Product Stability Investigations

Head: A. M. Gaddis

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Meat Flavor Components.* Normal and acquired meat flavor components are isolated and identified.

3. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

4. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

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5. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

Microbiology Investigations

Head: J. A. Alford

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are studied.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

HIDES AND LEATHER LABORATORY

Chief: J. Naghski

Room 2000, Ext. 227

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: E. F. Mellon

Room 2205, Ext. 367

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, and purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: E. M. Filachione

Room 2204, Ext. 360

1. *Protein Complex in Hides.* Basic principles relating to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: W. Windus

Room 1205, Ext. 217

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers and other hide products with new and extended industrial uses.

2. *New Unhairing Methods.* Chemicals and enzymes are being applied experimentally in the development of more rapid and economical unhairing and treating processes.

3. *Mineral Tannages*. Leather with improved resistance to deterioration is sought through the study of mineral tannages.

4. *Combination Tannages*. Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

5. *Test Methods*. Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leathers tanned by these materials.

6. *Translation of Laboratory Results to Industrial Use*. Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to the Industry to permit the translation of laboratory discoveries to practical applications.

PLANT PRODUCTS LABORATORY

Chief: C. F. Woodward

Room 3000, Ext. 246

The Plant Products Laboratory undertakes investigations on five specific plant products or groups of products, and also does analytical chemical research on these plants as well as on the composition of other agricultural commodities assigned to the Eastern Division. The five areas of investigation on plant products concern fruits, potatoes and other vegetables, honey, maple sirup, and tobacco.

Fruit Investigations

Acting Head: C. H. Hills

Room 3116, Ext. 270

1. *Study of Components*. This work is isolating and identifying the organic constituents of deciduous fruits. Of particular interest are those components that affect the color, flavor, aroma, and texture of raw and processed fruit products.

2. *Improvement in Processing*. Basic information on fruit constituents—their starch, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Preprocessing Quality*. The influence of variety, cultural practices, and preprocessing treatments on the quality of processed fruit products is studied.

4. *New Products*. An extended use of Eastern deciduous fruits is sought through the development of new food and industrial products that can be made from them.

Potato and Other Vegetable Investigations

Acting Head: R. H. Treadway Room 3123, Ext. 272

1. *Study of Components*. This work is isolating and identifying the constituents of potatoes and other vegetables. Of particular interest are those components that produce and control the color, flavor, and texture in fresh and processed products.

2. *Improvement in Processing*. Basic information on the constituents of potatoes and other vegetables—their starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Preprocessing Quality*. The influence of varieties, cultural practices, and storing conditions on the quality of potato and other vegetable products is studied.

4. *New Products*. An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

Honey Investigations

Head: J. W. White, Jr. Room 2110, Ext. 350

1. *Composition*. The composition of all domestic floral types of honey is studied, and the carbohydrates, acids, nitrogenous compounds, and other components having possible biological activity are isolated, identified and determined quantitatively.

2. *New and Improved Processes and Products*. Extended and improved uses for honey are sought through the development of new processes and products.

3. *New Analytical Techniques*. New methods of analysis applicable to honey utilization are developed.

4. *Beeswax*. The constituents of domestic beeswax related to quality are identified as an aid to improved refining of this apiary product.

Maple Investigations

Head: C. O. Willits

Room 2104, Ext. 351

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and of maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the micro-organisms in sap which affect the flavor, color, and production of maple products.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Products from Maple.* Improved and extended industrial uses of maple sirup are sought through the development of new processes and products.

Tobacco Investigations

Head: R. L. Stedman

Room 3110, Ext. 261

1. *Determination of Compounds.* The alkaloidal, polyphenolic, and resinous components of tobacco, which contribute to leaf quality or might otherwise be of significance in the overall utilization of tobacco, are isolated and characterized. New procedures are developed for separating, characterizing, and quantitatively determining these compounds.

2. *Industrial Uses.* New or extended industrial uses for these compounds are developed.

3. *Smoke Constituents.* The chemical components of tobacco smoke are isolated and characterized, and the information is applied to the solution of problems in tobacco utilization.

4. *New Products.* New and improved tobacco products are developed by the application of information obtained through this research.

Special Plant Investigations

Head: C. L. Ogg

Room 1117, Ext. 342

1. *Plant Screening.* Dioscorea plant species under agronomic study as a possible new crop are screened for steroidal sapogenins from which hormone drugs can be made.

2. *Determination of Spice Constituents.* Methods are developed for separating, characterizing, and quantitatively determining the constituents of spices important to their quality and use.

3. *Enzyme Inhibitors.* Pectinolytic and cellulolytic enzyme inhibitors from grape leaves and other plant materials are isolated and characterized.

4. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed and improved for the conduct of these investigations.

5. *Microanalytical Studies.* Microanalytical work is conducted for all Laboratories of the Division.

ENGINEERING AND DEVELOPMENT LABORATORY

Chief: R. K. Eskew

Room 3032, Ext. 247

The Engineering and Development Laboratory, which originates and evaluates in the pilot plant the engineering and cost aspects of new processes, is working in four investigation areas. Two of these consist of engineering studies on animal products and on plant products. The third is concerned with developing cost and design information, and the fourth with unit operations to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Head: N. C. Aceto

Room 3034, Ext. 374

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the product are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Planning for Larger-Scale Processing.* Plans are developed for semi-works and larger-scale processing.

5. *Advice to Industry.* Industry is kept advised on commercialization of developments.

Plant Products Engineering Investigations

Head: J. Cording, Jr.

Room 3024, Ext. 280

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the product are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Planning for Larger-Scale Processing.* Plans are developed for semi-works and larger-scale processing.

5. *Advice to Industry.* Industry is kept advised on commercialization of developments.

Cost and Design Engineering Investigations

Head: J. B. Claffey

Room 3028, Ext. 282

1. *Preliminary Cost Estimates.* To help determine the advisability of operating a proposed process on a pilot-plant scale, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive engineering estimates of the cost to operate a new process or to make a new plant or animal product are obtained as a means of determining its economic feasibility.

3. *Pilot-Plant Design and Assembly.* Information on the design of commercial units for processes studied by the Laboratory is developed and made available to industry.

5. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

Unit Operations Engineering Investigations

Head: Vacancy

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* These fundamental findings are related to practical pilot-plant operations.

PIONEERING RESEARCH LABORATORIES

PIONEERING RESEARCH LABORATORY FOR ANIMAL PROTEINS

Chief Research Chemist: T. L. McMeekin

Room 1013, Ext. 225

This Laboratory undertakes pioneering studies in the field of animal proteins. Its investigations encompass such considerations as the isolation, characterization, structure, properties, and reactions of animal proteins. New information is being developed in this Laboratory which is advancing the scientific knowledge of proteins and leading to new scientific principles and methods.

PIONEERING RESEARCH LABORATORY FOR ALLERGENS IN AGRICULTURAL PRODUCTS

Principal Research Biochemist: H. Stevens

Room 0125,* DUDley 8-2351

This Laboratory undertakes fundamental scientific investigations on the chemistry and immunology of allergens in agricultural products. These studies are concerned with the isolation and identification of the chemical and physiological properties of the allergens of food and industrial products derived from farm products, as well as with establishing the basic mechanisms whereby these materials produce the allergic response in man. The work of this Laboratory in the little-known field of immunochemistry is contributing to the general health of our people and is useful in pointing to methods of processing agricultural products so as to minimize their allergic effects.

*South Building, Washington, D. C.



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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

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U. S. DEPARTMENT OF AGRICULTURE**

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Agricultural Research Service

Dr. B. T. Shaw
Administrator

Dr. G. W. Irving, Jr.
Deputy Administrator
for Utilization Research and Development

2a
EASTERN UTILIZATION
RESEARCH AND DEVELOPMENT
DIVISION

Dr. P. A. Wells
Director

In 1938, Congress authorized the construction of four regional research laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 laboratories now known as the Eastern Utilization Research and Development Division. Seven of them are located in the Wyndmoor, Pa., headquarters, which is often referred to by its original name, the Eastern Regional Research Laboratory. The remaining 3 are located in the South Building, U. S. Department of Agriculture, Washington, D. C., and at the Agricultural Research Center, Beltsville, Md.

The Eastern Division conducts research on *animal products*: dairy, meat, rats, and leather; *plant products*: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; and *allergens studies*.

For the locations and fields of research of the other 3 Utilization Research and Development Divisions, see page 19.

April 1963

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OFFICE OF THE DIRECTOR

Dr. P. A. Wells
Director

Dr. R. E. Lothrop
Assistant Director, Program Operations

Dr. W. P. Ratchford
Assistant Director, Program Appraisal

Dr. W. I. Patterson*
Assistant Director, Program Development

Dr. R. H. Treadway
Assistant Director, Industrial Development

T. W. Quigley, Jr.* **E. C. Dryden**

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Assistants to Director

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Program Analysis, Patents

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Marketing Research

J. N. Boyd
Biometrical Services

Miss W. G. Woodward
Librarian

N. E. Roberts
Public Information Officer

ADMINISTRATIVE MANAGEMENT

E. A. Connor
Administrative Officer

PLANT MANAGEMENT

D. Gaspari
Acting Mechanical Superintendent

* Washington, D. C.

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Chief: Dr. W. C. Ault

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: Dr. A. N. Wrigley

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Isomerization.* Studies are carried out on the isomerization of double bonds of unsaturated fatty acids and derivatives from animal fats.

3. *Peroxides.* Peroxides are prepared from animal fats, and their properties, reactions, and applications are investigated.

4. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Polymerization mechanisms involved are studied, and the chemical reactions of the polymers are investigated.

5. *Structures of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: Vacancy

1. *Halogens.* Means of introducing halogens into fatty molecules are studied, and the mechanism of the reactions involved in stabilizing materials containing polymeric halogens is investigated.

2. *Alkylene Oxides.* Alkylene oxides are reacted with suitable fatty derivatives to make lubricant additives.

3. *New Lubricants.* New and useful products in the field of lubricants and lubricant additives are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives.

Detergents Investigations

Head: Dr. A. J. Stirton

1. *New Surface-Active Products.* Surface-active compounds made from suitable animal-fat derivatives are prepared and evaluated as detergents, wetting agents, emulsifiers, and similar products.

2. *Combination Detergents.* Detergents that are more efficient, or have a combination of useful properties, are sought by combining fat-derived compounds with soaps or other surface-active materials.

Exploratory Reactions Investigations

Head: Dr. D. Swern

1. *Activation Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats.

2. *Radiation-Induced Reactions.* Radiation-induced reactions are conducted on animal fats and derived fatty acids.

3. *Metalloid Derivatives.* Metalloid derivatives are prepared from animal fats and their component fatty acids.

ANIMAL FAT PROPERTIES LABORATORY

Chief: Dr. L. P. Witnauer

The Animal Fat Properties Laboratory investigates the chemical composition and structure of animal fats and the vegetable fatty acids from some uncultivated plants, studies the molecular structure of such animal products as fats and hides and their derivatives, and determines their basic physical properties and evaluates potentially useful products made from them.

Chemical Composition and Structure Investigations

Head: R. W. Riemenschneider

1. *Methodology.* New and improved methods are developed for quantitatively fractionating and determining the fat components of meat fats, such as glycerides, fatty acids, cholesterol and esters, and phospholipids.

2. *Glycerides.* The principal glycerides of meat fats are isolated or synthesized so that their structure and physical behavior can be interrelated.

3. *Autoxidation of Fats.* Studies are made on the rate, extent, and products of autoxidation of pure unsaturated fatty acids and their derivatives as influenced by metal salts, amino acids, emulsifiers, antioxidants, etc.

4. *New Crop Seed Oils.* The epoxy fatty acids of oils obtained from uncultivated plants, which can be modified for use in plastic compositions, are isolated and their properties determined.

Physical Properties Investigations

Head: Dr. H. Susi

1. *Inter- and Intramolecular Structure.* The inter- and intramolecular structure of long-chain compounds found in or related to fats, of proteins such as collagen found in hides, and of pertinent model compounds is investigated by means of absorption spectroscopy, X-ray diffraction, and nuclear magnetic resonance methods.

2. *Special Techniques.* Special experimental techniques such as absorption spectroscopy at very low temperatures, studies on thin oriented films, and infrared measurements in aqueous solution are developed and adapted for investigating the structural characteristics of animal and other products in collaboration with other investigations groups.

3. *Molecular Characterization.* Molecular characteristics such as hydrogen bonding energies, rotational isomerisms, and normal vibrations of compounds derived from and related to animal products such as fats and hides are investigated by applying experimental techniques in conjunction with theoretical calculations.

Product Properties Evaluation Investigations

Head: Vacancy

1. *Fundamental Properties.* The mechanical, electrical, thermal, and solution properties of animal products such as native and modified collagen and polymeric substances derived from fats are studied and the results are interpreted on a molecular basis.

2. *Special Techniques.* Mechanical and electrical measurement, electron microscopy, light scattering, electrophoresis, differential thermal analysis, and rheological techniques are applied and new methods and apparatus are developed to study the properties of animal and other products.

3. *Evaluation of New Compositions.* Compositions based on animal products such as fats and hides are evaluated through studies of their mechanical behavior and thermal stability by conventional test methods to determine their potential use as plastics, plasticizers, foams, leathers, etc.

DAIRY PRODUCTS LABORATORY

Chief: Dr. B. H. Webb (Washington, D. C.)

The work of the Dairy Products Laboratory falls within four principal investigation areas. One is devoted to a study of milk concentrates and dried milks; the second to cheese, butterfat, and fermented products; the third to the complicated problem of retaining flavor in processed milks; and the fourth to a method for the removal of isotopes from milk.

Milk Concentrates Investigations

Head: Dr. M. J. Pallansch (Washington, D. C.)

1. *Chemistry of Milk Components.* The organic and physical chemistry of the proteins, lipids, and sugars of milk are studied.

2. *Fat Stabilization.* Means are sought to stabilize the butterfat in concentrated milks against oxidative changes.

3. *Dry Whole Milk.* The physico-chemical effects of the drying process on whole milk are studied with a view to the development of a dried whole milk.

4. *Evaporated Milks and Frozen Concentrates.* Improved evaporated and frozen concentrated milks are developed.

Cheese and Butterfat Investigations

Head: Dr. R. P. Tittsler (Washington, D. C.)

1. *Butter and Cream Research.* Butter and butter oil are being worked on to improve their stability, new butterfat products are under development, and better processes for handling and preserving butter and cream are sought through basic studies of their physical properties.

2. *Cheese Cultures.* Microbiological research is directed to the control of microbiological activity in cheese and other cultured dairy products.

3. *Cheesemaking Procedures.* More economical and efficient methods of making cheese are developed.

4. *Milk in Baked Goods.* A wider use of milk in baked goods is sought by the development of such products as high-milk protein bread, and improved milks for such use are developed.

5. *Whey Utilization.* The development of new and improved processes and products for the utilization of whey is being sought through a study of the chemical and biochemical characteristics of whey and its components.

Milk Flavor Investigations

Head: Vacancy (Washington, D. C.)

1. *Basic Studies on Milk Flavors.* The individual constituents of milk flavors are being isolated, purified, and identified, and the mechanism of flavor formation is being established.

2. *Flavor Stability.* Procedures are worked out to preserve desirable flavors and to prevent the formation of off-flavors.

3. *Off-Flavor Removal.* Processes are sought to remove the off-flavors that develop in both manufacturing and marketing milk.

4. *Taste Testing.* Statistically sound sensory tests are developed and correlated with objective tests so that flavor changes in milk and its products can be measured precisely.

Isotope Removal Investigations

Head: Dr. L. F. Edmondson (Beltsville, Md.)

1. *Methods of Isotope Removal.* Basic studies are made on the preferential removal of radioactive nuclides from milk.

2. *Development of a Process.* A practical plant process for removing radioactive nuclides from milk is sought.

3. *Effects of Isotope Removal.* The effect of this process on the composition, flavor, and nutritive value of milk is evaluated.

4. *Radioactivity Monitoring.* Practical plant methods are developed for the monitoring of radioactivity.

MILK PROPERTIES LABORATORY

Chief: Dr. G. C. Nutting

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of this work is directly related to the effects of processing on milk properties.

Biochemical Properties Investigations

Head: Dr. C. A. Zittle

1. *Milk Enzymes.* The basic chemistry of milk enzymes is studied and methods are developed for their purification and characterization.

2. *Protein Structure.* Purified proteins are split by specific proteolytic enzymes to peptide fragments, and these fragments are studied to determine their amino acid sequence and fine structure.

3. *Reactions of Milk Proteins and Salts.* The effect of heat on milk proteins in the presence of milk salts is determined.

4. *Interaction of Components.* The interaction between the various components of milk is evaluated.

5. *Basic Studies Related to Storage of Concentrated Milks.* Better resistance of concentrated milks to fat separation and gelation on storage is sought through the development of basic information.

Physical-Chemical Properties Investigations

Head: Dr. S. N. Timasheff

1. *Molecular-Kinetic Properties of Milk Proteins in Solution.* Such phenomena are studied as aggregation-dissociation, structural transformations, binding of small molecules and ions, and genetic differences.

2. *Inter-Molecular Forces.* The forces acting between protein and other molecules are investigated, as are the specificity of the forces and the nature of the processes that take place at particular interaction sites.

3. *Special Techniques.* Ultracentrifugal, electrophoretic, light-scattering, and radioactive-tracer techniques are applied in collaboration with other investigations groups within the Division.

4. *Macromolecular Studies.* Thermodynamics and statistical mechanics of macromolecules are studied.

MEAT LABORATORY

Chief: W. L. Sulzbacher (Beltsville, Md.)

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and at developing better methods of handling, preserving, and processing meats. These investigations are carried out in the areas of composition and quality, product stability, and microbiology.

Composition and Quality Investigations

Head: C. E. Swift (Beltsville, Md.)

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats to obtain products with more desirable qualities, including nutritive value, and to secure the optimum utilization of meats from all commercial grades and cuts.

Product Stability Investigations

Head: A. M. Gaddis (Beltsville, Md.)

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Meat Flavor Components.* Normal and acquired meat flavor components are isolated and identified.

3. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

4. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

5. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

Microbiology Investigations

Head: Dr. J. A. Alford (Beltsville Md.)

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are studied.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

HIDES AND LEATHER LABORATORY

Chief: Dr. J. Naghski

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: Dr. E. F. Mellon

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, and purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: Dr. E. M. Filachione

1. *Protein Complex in Hides.* Basic principles relating to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: Dr. W. Windus

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers and other hide products with new and extended industrial uses.

2. *New Unhairing Methods.* Chemicals and enzymes are being applied experimentally in the development of more rapid and economical unhairing and treating processes.

3. *Mineral Tannages.* Leather with improved resistance to deterioration is sought through the study of mineral tannages.

4. *Combination Tannages.* Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

5. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leathers tanned by these materials.

6. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to the Industry to permit the translation of laboratory discoveries to practical applications.

PLANT PRODUCTS LABORATORY

Chief: Dr. C. F. Woodward

The Plant Products Laboratory undertakes investigations on five specific plant products or groups of products, and also does analytical chemical research on these plants as well as on the composition of other agricultural commodities assigned to the Eastern Division. The five areas of investigation on plant products concern fruits, potatoes and other vegetables, honey, maple sirup, and tobacco.

Fruit Investigations

Head: Dr. C. H. Hills

1. *Study of Components.* This work is isolating and identifying the organic constituents of deciduous fruits. Of particular interest are those components that affect the color, flavor, aroma, and texture of raw and processed fruit products.

2. *Improvement in Processing.* Basic information on fruit constituents—their starch, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Preprocessing Quality.* The influence of variety, cultural practices, and preprocessing treatments on the quality of processed fruit products is studied.

4. *New Products.* An extended use of Eastern deciduous fruits is sought through the development of new food and industrial products that can be made from them.

Potato and Other Vegetable Investigations

Head: Dr. W. L. Porter

1. *Study of Components.* This work is isolating and identifying the constituents of potatoes and other vegetables. Of particular interest are those components that produce and control the color, flavor, and texture in fresh and processed products.

2. *Improvement in Processing.* Basic information on the constituents of potatoes and other vegetables—their starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Preprocessing Quality.* The influence of varieties, cultural practices, and storing conditions on the quality of potato and other vegetable products is studied.

4. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

Honey Investigations

Head: Dr. J. W. White, Jr.

1. *Composition.* The composition of all domestic floral types of honey is studied, and the carbohydrates, acids, nitrogenous compounds, and other components having possible biological activity are isolated, identified, and determined quantitatively.

2. *New and Improved Processes and Products.* Extended and improved uses for honey are sought through the development of new processes and products.

3. *New Analytical Techniques.* New methods of analysis applicable to honey utilization are developed.

4. *Beeswax.* The constituents of domestic beeswax related to quality are identified as an aid to improved refining of this apiary product.

Maple Investigations

Head: Dr. C. O. Willits

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and of maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Products from Maple.* Improved and extended industrial uses of maple sirup are sought through the development of new processes and products.

Tobacco Investigations

Head: Dr. R. L. Stedman

1. *Determination of Compounds.* The alkaloidal, polyphenolic, and resinous components of tobacco, which contribute to leaf quality or might otherwise be of significance in the overall utilization of tobacco, are isolated and characterized. New procedures are developed for separating, characterizing, and quantitatively determining these compounds.

2. *Industrial Uses.* New or extended industrial uses for these compounds are developed.

3. *Smoke Constituents.* The chemical components of tobacco smoke are isolated and characterized, and the information is applied to the solution of problems in tobacco utilization.

4. *New Products.* New and improved tobacco products are developed by the application of information obtained through this research.

Special Plant Investigations

Head: Dr. C. L. Ogg

1. *Plant Screening.* Dioscorea plant species under agronomic study as a possible new crop are screened for steroidal sapogenins from which hormone drugs can be made.

2. *Determination of Spice Constituents.* Methods are developed for separating, characterizing, and quantitatively determining the constituents of spices important to their quality and use.

3. *Enzyme Inhibitors.* Pectinolytic and cellulolytic enzyme inhibitors from grape leaves and other plant materials are isolated and characterized.

4. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed and improved for the conduct of these investigations.

5. *Microanalytical Studies.* Microanalytical work is conducted for all Laboratories of the Division.

ENGINEERING AND DEVELOPMENT LABORATORY

Chief: R. K. Eskew

The Engineering and Development Laboratory, which originates and evaluates in the pilot plant the engineering and cost aspects of new processes, is working in four investigation areas. Two of these consist of engineering studies on animal products and on plant products. The third is concerned with developing cost and design information, and the fourth with unit operations to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Head: N. C. Aceto

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the product are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Planning for Larger-Scale Processing.* Plans are developed for semi-works and larger-scale processing.

5. *Advice to Industry.* Industry is kept advised on commercialization of developments.

Plant Products Engineering Investigations

Head: J. Cording, Jr.

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the product are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Planning for Larger-Scale Processing.* Plans are developed for semi-works and larger-scale processing.

5. *Advice to Industry.* Industry is kept advised on commercialization of developments.

Cost and Design Engineering Investigations

Head: Vacancy

1. *Preliminary Cost Estimates.* To help determine the advisability of operating a proposed process on a pilot-plant scale, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive engineering estimates of the cost to operate a new process or to make a new plant or animal product are obtained as a means of determining its economic feasibility.

3. *Pilot-Plant Design and Assembly.* Information on the design of commercial units for processes studied by the Laboratory is developed and made available to industry.

4. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

Unit Operations Engineering Investigations

Head: H. I. Sinnamon

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* These fundamental findings are related to practical pilot-plant operation.

PIONEERING RESEARCH LABORATORIES

PIONEERING RESEARCH LABORATORY FOR ANIMAL PROTEINS

Chief Research Chemist: Dr. T. L. McMeekin

This Laboratory undertakes pioneering studies in the field of animal proteins. Its investigations encompass such considerations as the isolation, characterization, structure, properties, and reactions of animal proteins. New information is being developed in this Laboratory which is advancing the scientific knowledge of proteins and leading to new scientific principles and methods.

PIONEERING RESEARCH LABORATORY FOR ALLERGENS IN AGRICULTURAL PRODUCTS

Principal Research Biochemist:

Dr. H. Stevens (Washington, D. C.)

This Laboratory undertakes fundamental scientific investigations on the chemistry and immunology of allergens in agricultural products. These studies are concerned with the isolation and identification of the chemical and physiological properties of the allergens of food and industrial products derived from farm products, as well as with establishing the basic mechanisms whereby these materials produce the allergic response in man. The work of this Laboratory in the little-known field of immunochemistry is contributing to the general health of our people and is useful in pointing to methods of processing agricultural products so as to minimize their allergic effects.

DIRECTORY

<u>Location</u>	<u>Name</u>	<u>Telephone</u>
Wyndmoor, Pa.		CHestnut Hill 7-5800
Room		Extension
3034	Aceto, N. C.	374
3006	Ault, W. C.	244
2026	Connor, E. A.	240
3024	Cording, J., Jr.	280
2015	Dryden, E. C.	230
3032	Eskew, R. K.	247
2204	Filachione, E. M.	360
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3116	Hills, C. H.	270
2025	Jasewicz, L. B. (Miss)	317
2019	Krider, M. M.	212
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3122	Mellon, E. F.	363
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1030	Nutting, G. C.	285
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3128	Porter, W. L.	272
2015	Ratchford, W. P.	210
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3015	Sills, M. W.	218
3026	Sinnamon, H. I.	281
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1004	Woodward, W. G. (Miss)	215
3101	Wrigley, A. N.	229
1100	Zittle, C. A.	332

South Bldg. Wash. 25, D. C.

Room		DUDley 8-
0612	Pallansch, M. J.	2484
1655	Patterson, W. I.	2361
1669	Quigley, T. W., Jr.	6169
0125	Stevens, H.	2351
1639	Tittsler, R. P.	2465
1644	Webb, B. H.	2365

Agr. Res. Center Beltsville, Md.

GRanite 4-4800

Building No.		Extension
200	Alford, J. A.	394
157	Edmondson, L. F.	582
200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394
200	Swift, C. E.	394

OTHER UTILIZATION RESEARCH AND DEVELOPMENT DIVISIONS

NORTHERN

Address and Telephone Number

1815 N. University St.
Peoria 5, Ill.
682-5481

Director

Dr. F. R. Senti

Fields of Research

Cereal grains: corn, wheat, barley, grain sorghum, and oats; oilseeds: soybean, flaxseed, safflower, and erucic acid-containing oilseeds; new crops.

SOUTHERN

Address and Telephone Number

1100 Robert E. Lee Blvd. (P.O. Box 19687)
New Orleans 19, La.
282-1441

Director

Dr. C. H. Fisher

Fields of Research

Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citrus, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts; new crops.

WESTERN

Address and Telephone Number

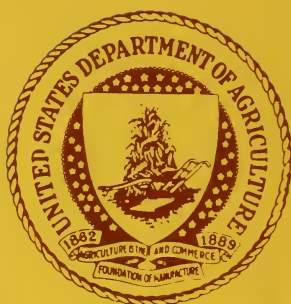
800 Buchanan St.
Albany 10, Calif.
Landscape 5-2244

Director

Dr. M. J. Copley

Fields of Research

Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat; barley; wool and mohair; sugar beets; dry beans and peas; castor beans; new crops.



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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

AUG 14 1964

C & R-PREP.

Wyndmoor, Pa.

ADDRESS:

600 East Mermaid Lane
Philadelphia, Pa. 19118
Telephone: 215 CHestnut Hill 7-5800

Washington Laboratories
South Building, USDA
14th St. & Independence Ave., S. W.
Washington, D. C. 20250
Telephone: 202 REpublic 7-4142

Beltsville Laboratories
Agricultural Research Center
Beltsville, Md. 20705
Telephone: 301 GRanite 4-4800

Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE

**U. S. Department of Agriculture
Agricultural Research Service**

Dr. B. T. Shaw
Administrator

Dr. G. W. Irving, Jr.
Deputy Administrator
for Nutrition, Consumer, and
Industrial Utilization Research

**EASTERN UTILIZATION
RESEARCH AND DEVELOPMENT
DIVISION**

Dr. P. A. Wells
Director

In 1938, Congress authorized the construction of four Regional Research Laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 laboratories now known as the Eastern Utilization Research and Development Division.

Research is conducted in these Eastern Division laboratories on *animal products*: dairy, meat, fats, and leather; *plant products*: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; and *allergens studies*.

Most of the laboratories where this work is done are located in the headquarters building at Wyndmoor, Pa., often referred to by its original name, the Eastern Regional Research Laboratory. Exceptions are the Dairy Products Laboratory, located in the South Building, U. S. Department of Agriculture, Washington, D. C., and at the Agricultural Research Center, Beltsville, Md.; the Meat Laboratory, located at Beltsville and Wyndmoor; and a special processing laboratory for potato products, now under construction at East Grand Forks, Minnesota, which will be the only Investigations Group of the Engineering and Development Laboratory not located at Wyndmoor.

For the locations and fields of research of the other three Utilization Research and Development Divisions, see page 19.

February 1964

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OFFICE OF THE DIRECTOR

Dr. P. A. Wells
Director

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Assistant Director, Program Operations

Dr. W. P. Ratchford
Assistant Director, Program Appraisal

Dr. W. I. Patterson*
Assistant Director, Program Development

Dr. R. H. Treadway
Assistant Director, Industrial Development

T. W. Quigley, Jr.* **E. C. Dryden**
Miss L. B. Jasewicz
Assistants to Director

Dr. M. M. Krider
Program Analysis, Patents

M. W. Sills
Marketing Research

J. N. Boyd
Biometrical Services

Miss W. G. Woodward
Librarian

N. E. Roberts
Public Information Officer

ADMINISTRATIVE MANAGEMENT

E. A. Connor
Assistant to Director for Management

PLANT MANAGEMENT

D. Gaspari
Mechanical Superintendent

* Washington, D. C.

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Chief: Dr. W. C. Ault

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: Dr. A. N. Wrigley

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Isomerization.* Studies are carried out on the isomerization of double bonds of unsaturated fatty acids and derivatives from animal fats.

3. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Polymerization mechanisms involved are studied, and the chemical reactions of the polymers are investigated.

4. *Structures of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: Vacancy

1. *Halogens.* Means of introducing halogens into fatty molecules are studied, and the mechanism of the reactions involved in stabilizing materials containing polymeric halogens is investigated.

2. *Alkylene Oxides.* Alkylene oxides are reacted with suitable fatty derivatives to make lubricant additives.

3. *New Lubricants.* New and useful products in the field of lubricants and lubricant additives are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives.

Detergents Investigations

Head: Dr. A. J. Stirton

1. *New Surface-Active Products.* Surface-active compounds made from suitable animal-fat derivatives are prepared and evaluated as detergents, wetting agents, emulsifiers, and similar products.

2. *Combination Detergents.* Detergents that are more efficient, or have a combination of useful properties, are sought by combining fat-derived compounds with soaps or other surface-active materials.

Exploratory Reactions Investigations

Acting Head: Dr. L. S. Silbert

1. *Activation Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats.

2. *Peroxides.* Peroxides are prepared from animal fats, and their properties, reactions, and applications are investigated.

3. *Metalloid Derivatives.* Metalloid derivatives are prepared from animal fats and their component fatty acids.

ANIMAL FAT PROPERTIES LABORATORY

Chief: Dr. L. P. Witnauer

The Animal Fat Properties Laboratory investigates the chemical composition and structure of animal fats and the vegetable fatty acids from some uncultivated plants, studies the molecular structure of such animal products as fats and hides and their derivatives, and determines their basic physical properties and evaluates potentially useful products made from them.

Chemical Composition and Structure Investigations

Head: R. W. Riemenschneider

1. *Methodology.* New and improved methods are developed for quantitatively fractionating and determining the fat components of meat fats, such as glycerides, fatty acids, cholesterol and esters, and phospholipids.

2. *Glycerides.* The principal glycerides of meat fats are isolated or synthesized so that their structure and physical behavior can be interrelated.

3. *Autoxidation of Fats.* Studies are made on the rate, extent, and products of autoxidation of pure unsaturated fatty acids and their derivatives as influenced by metal salts, amino acids, emulsifiers, antioxidants, etc.

4. *New Crop Seed Oils.* The epoxy fatty acids of oils obtained from uncultivated plants, which can be modified for use in plastic compositions, are isolated and their properties determined.

Physical Properties Investigations

Head: Dr. H. Susi

1. *Inter- and Intramolecular Structure.* The inter- and intramolecular structure of long-chain compounds found in or related to fats, of proteins such as collagen found in hides, and of pertinent model compounds is investigated by means of absorption spectroscopy, X-ray diffraction, and nuclear magnetic resonance methods.

2. *Special Techniques.* Special experimental techniques such as absorption spectroscopy at very low temperatures, studies on thin oriented films, and infrared measurements in aqueous solution are developed and adapted for investigating the structural characteristics of animal and other products in collaboration with other investigations groups.

3. *Molecular Characterization.* Molecular characteristics such as hydrogen bonding energies, rotational isomerisms, and normal vibrations of compounds derived from and related to animal products such as fats and hides are investigated by applying experimental techniques in conjunction with theoretical calculations.

Product Properties Evaluation Investigations

Head: Vacancy

1. *Fundamental Properties.* The mechanical, electrical, thermal, and solution properties of animal products such as native and modified collagen and polymeric substances derived from fats are studied and the results are interpreted on a molecular basis.

2. *Special Techniques.* Mechanical and electrical measurement, electron microscopy, light scattering, electrophoresis, differential thermal analysis, and rheological techniques are applied and new methods and apparatus are developed to study the properties of animal and other products.

3. *Evaluation of New Compositions.* Compositions based on animal products such as fats and hides are evaluated through studies of their mechanical behavior and thermal stability by conventional test methods to determine their potential use as plastics, plasticizers, foams, leathers, etc.

DAIRY PRODUCTS LABORATORY

Chief: Dr. B. H. Webb (Washington, D. C.)

The work of the Dairy Products Laboratory falls within four principal investigation areas. One is devoted to a study of milk concentrates and dried milks; the second to cheese, butterfat, and fermented products; the third to the complicated problem of retaining flavor in processed milks; and the fourth to a method for the removal of isotopes from milk.

Milk Concentrates Investigations

Head: Dr. M. J. Pallansch (Washington, D. C.)

1. *Chemistry of Milk Components.* The organic and physical chemistry of the proteins, lipids, and sugars of milk are studied.

2. *Fat Stabilization.* Means are sought to stabilize the butterfat in concentrated milks against oxidative changes.

3. *Dry Whole Milk.* The physico-chemical effects of the drying process on whole milk are studied with a view to the development of a dried whole milk.

4. *Evaporated Milks and Frozen Concentrates.* Improved evaporated and frozen concentrated milks are developed.

Cheese and Butterfat Investigations

Head: Dr. R. P. Tittsler (Washington, D. C.)

1. *Butter and Cream Research.* Butter and butter oil are being worked on to improve their stability, new butterfat products are under development, and better processes for handling and preserving butter and cream are sought through basic studies of their physical properties.

2. *Cheese Cultures.* Microbiological research is directed to the control of microbiological activity in cheese and other cultured dairy products.

3. *Cheesemaking Procedures.* More economical and efficient methods of making cheese are developed.

4. *Milk in Baked Goods.* A wider use of milk in baked goods is sought by the development of such products as high-milk protein bread, and improved milks for such use are developed.

5. *Whey Utilization.* The development of new and improved processes and products for the utilization of whey is being sought through a study of the chemical and biochemical characteristics of whey and its components.

Milk Flavor Investigations

Head: Vacancy (Washington, D. C.)

1. *Basic Studies on Milk Flavors.* The individual constituents of milk flavors are being isolated, purified, and identified, and the mechanism of flavor formation is being established.

2. *Flavor Stability.* Procedures are worked out to preserve desirable flavors and to prevent the formation of off-flavors.

3. *Off-Flavor Removal.* Processes are sought to remove the off-flavors that develop in both manufacturing and marketing milk.

4. *Taste Testing.* Statistically sound sensory tests are developed and correlated with objective tests so that flavor changes in milk and its products can be measured precisely.

Isotope Removal Investigations

Head: Dr. L. F. Edmondson (Beltsville, Md.)

1. *Methods of Isotope Removal.* Basic studies are made on the preferential removal of radioactive nuclides from milk.

2. *Development of a Process.* A practical plant process for removing radioactive nuclides from milk is sought.

3. *Effects of Isotope Removal.* The effect of this process on the composition, flavor, and nutritive value of milk is evaluated.

4. *Radioactivity Monitoring.* Practical plant methods are developed for the monitoring of radioactivity.

MILK PROPERTIES LABORATORY

Chief: Dr. G. C. Nutting

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of this work is directly related to the effects of processing on milk properties. Most of this work relates to the proteins and enzymes of milk.

Biochemical Properties Investigations

Head: Dr. C. A. Zittle

1. *Milk Enzymes.* The basic chemistry of milk enzymes is studied and methods are developed for their purification and characterization.

2. *Protein Structure.* Purified proteins are split by specific proteolytic enzymes to peptide fragments, and these fragments are studied to determine their amino acid sequence and fine structure.

3. *Reactions of Milk Proteins and Salts.* The effect of heat on milk proteins in the presence of milk salts is determined.

4. *Interaction of Components.* The interaction between the various components of milk is evaluated.

5. *Basic Studies Related to Storage of Concentrated Milks.* Better resistance of concentrated milks to fat separation and gelation on storage is sought through the development of basic information.

Physical-Chemical Properties Investigations

Head: Dr. S. N. Timasheff

1. *Molecular-Kinetic Properties of Milk Proteins in Solution.* Such phenomena are studied as aggregation-dissociation, structural transformations, binding of small molecules and ions, and genetic differences.

2. *Inter-Molecular Forces.* The forces acting between protein and other molecules are investigated, as are the specificity of the forces and the nature of the processes that take place at particular interaction sites.

3. *Special Techniques.* Ultracentrifugal, electrophoretic, light-scattering, and radioactive-tracer techniques are applied in collaboration with other investigations groups within the Division.

4. *Macromolecular Studies.* Thermodynamics and statistical mechanics of macromolecules are studied.

MEAT LABORATORY

Chief: W. L. Sulzbacher (Beltsville, Md.)

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and developing better methods of handling, preserving, and processing meats. These investigations are carried out in the areas of composition and quality, flavor, microbiology, and product stability.

Composition and Quality Investigations

Head: C. E. Swift (Wyndmoor, Pa.)

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats so that the products obtained will have more tenderness and juiciness and better color, and so that meats from all commercial grades and cuts will be utilized to their optimum.

Meat Flavor Investigations

Head: Dr. A. E. Wasserman (Wyndmoor, Pa.)

1. *Flavor Precursors.* Meat flavor precursors and compounds are isolated and characterized, and then modification by processing techniques is studied.

2. *Wood Smokes.* The wood smokes used in meat processing are studied to determine their chemical composition and the interaction of their components with meat constituents.

3. *Taste Studies.* Meats, meat products, and chemical components of meat flavors are evaluated organoleptically.

4. *Improvement in Meat Flavor.* Results of these flavor studies are applied to the production of new and improved meat products.

Microbiology Investigations

Head: Dr. J. A. Alford (Beltsville, Md.)

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are developed.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures or during meat processing, and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

Product Stability Investigations

Head: A. M. Gaddis (Beltsville, Md.)

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

3. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

4. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

HIDES AND LEATHER LABORATORY

Chief: Dr. J. Naghski

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: Dr. E. F. Mellon

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, and purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: Dr. E. M. Filachione

1. *Protein Complex in Hides.* Basic principles relating to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: Dr. W. Windus

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers and other hide products with new and extended industrial uses.

2. *New Unhairing Methods.* Chemicals and enzymes are being applied experimentally in the development of more rapid and economical unhairing and treating processes.

3. *Mineral Tannages.* Leather with improved resistance to deterioration is sought through the study of mineral tannages.

4. *Combination Tannages.* Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

5. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leathers tanned by these materials.

6. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to the Industry to permit the translation of laboratory discoveries to practical applications.

PLANT PRODUCTS LABORATORY

Chief: Dr. C. F. Woodward

The Plant Products Laboratory undertakes investigations on five specific plant products or groups of products, and also does analytical chemical research on these plants as well as on the composition of other agricultural commodities assigned to the Eastern Division. The five areas of investigation on plant products concern fruits, potatoes and other vegetables, honey, maple sirup, and tobacco.

Fruit Investigations

Head: Dr. C. H. Hills

1. *Study of Components.* This work is isolating and identifying the organic constituents of deciduous fruits. Of particular interest are those components that affect the color, flavor, aroma, and texture of raw and processed fruit products.

2. *Improvement in Processing.* Basic information on fruit constituents—their starch, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Preprocessing Quality.* The influence of variety, cultural practices, and preprocessing treatments on the quality of processed fruit products is studied.

4. *New Products.* An extended use of Eastern deciduous fruits is sought through the development of new food and industrial products that can be made from them.

Potato and Other Vegetable Investigations

Head: Dr. W. L. Porter

1. *Study of Components.* This work is isolating and identifying the constituents of potatoes and other vegetables. Of particular interest are those components that produce and control the color, flavor, and texture in fresh and processed products.

2. *Improvement in Processing.* Basic information on the constituents of potatoes and other vegetables—their starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Preprocessing Quality.* The influence of varieties, cultural practices, and storing conditions on the quality of potato and other vegetable products is studied.

4. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

Honey Investigations

Head: Dr. J. W. White, Jr.

1. *Composition.* The composition of all domestic floral types of honey is studied, and the carbohydrates, acids, nitrogenous compounds, and other components having possible biological activity are isolated, identified, and determined quantitatively.

2. *New and Improved Processes and Products.* Extended and improved uses for honey are sought through the development of new processes and products.

3. *New Analytical Techniques.* New methods of analysis applicable to honey utilization are developed.

4. *Beeswax.* The constituents of domestic beeswax related to quality are identified as an aid to improved refining of this apiary product.

Maple Investigations

Head: Dr. C. O. Willits

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and of maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Products from Maple.* Improved and extended industrial uses of maple sirup are sought through the development of new processes and products.

Tobacco Investigations

Head: Dr. R. L. Stedman

1. *Determination of Compounds.* The alkaloidal, polyphenolic, and resinous components of tobacco, which contribute to leaf quality or might otherwise be of significance in the overall utilization of tobacco, are isolated and characterized. New procedures are developed for separating, characterizing, and quantitatively determining these compounds.

2. *Industrial Uses.* New or extended industrial uses for these compounds are developed.

3. *Smoke Constituents.* The chemical components of tobacco smoke are isolated and characterized, and the information is applied to the solution of problems in tobacco utilization.

4. *New Products.* New and improved tobacco products are developed by the application of information obtained through this research.

Special Plant Investigations

Head: Dr. C. L. Ogg

1. *Plant Screening.* Dioscorea plant species under agronomic study as a possible new crop are screened for steroidal sapogenins from which hormone drugs can be made.

2. *Determination of Spice Constituents.* Methods are developed for separating, characterizing, and quantitatively determining the constituents of spices important to their quality and use.

3. *Enzyme Inhibitors.* Pectinolytic and cellulolytic enzyme inhibitors from grape leaves and other plant materials are isolated and characterized.

4. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed and improved for the conduct of these investigations.

5. *Microanalytical Studies.* Microanalytical work is conducted for all Laboratories of the Division.

ENGINEERING and DEVELOPMENT LABORATORY

Chief: R. K. Eskew

The Engineering and Development Laboratory, which originates, evaluates, and develops new processes on a pilot-plant scale, is working in five investigation areas. Two of these are concerned with the development of new and improved products from animals and plants. The third is devoted to existing commercial processes for making potato products, and considers the adaptability to these processes of new and experimental potato varieties. In the fourth investigation area, cost and design information are developed, and in the fifth, unit operations are conducted to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Head: N. C. Aceto

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on the commercialization of developments.

Plant Products Engineering Investigations

Head: J. Cording, Jr.

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on the commercialization of developments.

Potato Products Investigations

Head: R. L. Shaw, Jr.

(East Grand Forks, Minnesota)

1. *Processing Quality.* Varietal, cultural, storage, and other source factors are evaluated for their effect on the quality of commercial forms of processed potatoes.

2. *Composition of New Varieties.* The gross composition of new and experimental potato varieties is related to established processing methods and quality of products.

3. *Processing Potential from New Varieties.* Laboratory methods are devised and developed to screen new and experimental varieties of potatoes for their processing potential.

4. *Pilot-Plant Experimentation.* Integrated pilot plants are planned and operated to accurately foretell the effects of the cultural and varietal factors on a commercial scale.

5. *Product Evaluation.* Experimental products are evaluated by appropriate subjective and objective methods.

Cost and Design Engineering Investigations

Head: Vacancy

1. *Preliminary Cost Estimates.* To help determine the advisability of operating a proposed process on a pilot-plant scale, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive cost estimates are made for the commercial production and distribution of new products made from plant and animal commodities as a basis for determining their economic feasibility.

3. *Pilot-plant Design and Assembly.* Integrated pilot plants are designed and assembled for obtaining engineering data for cost estimates.

4. *Advice to Industry.* Information is obtained for advice to industry on the design of commercial units for processes developed by the Laboratory.

5. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

Unit Operations Engineering Investigations

Head: H. I. Sinnamon

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* These fundamental findings are related to practical pilot-plant operation.

PIONEERING RESEARCH LABORATORIES

PIONEERING RESEARCH LABORATORY FOR ANIMAL PROTEINS

Chief Research Chemist: Dr. T. L. McMeekin

This Laboratory undertakes pioneering studies in the field of animal proteins. Its investigations encompass such considerations as the isolation, characterization, structure, properties, and reactions of animal proteins. New information is being developed in this Laboratory which is advancing the scientific knowledge of proteins and leading to new scientific principles and methods.

PIONEERING RESEARCH LABORATORY FOR ALLERGENS IN AGRICULTURAL PRODUCTS

Principal Research Biochemist:

Dr. H. Stevens (Washington, D. C.)

This Laboratory undertakes fundamental scientific investigations on the chemistry and immunology of allergens in agricultural products. These studies are concerned with the isolation and identification of the chemical and physiological properties of the allergens of food and industrial products derived from farm products, as well as with establishing the basic mechanisms whereby these materials produce the allergic response in man. The work of this Laboratory in the little-known field of immunochemistry is contributing to the general health of our people and is useful in pointing to methods of processing agricultural products so as to minimize their allergic effects.

DIRECTORY

<u>Location</u>	<u>Name</u>	<u>Telephone</u>
Wyndmoor, Pa.		CHestnut Hill 7-5800
<u>Room</u>		<u>Extension</u>
3034	Aceto, N. C.	374
3006	Ault, W. C.	244
2026	Connor, E. A.	240
3024	Cording, J., Jr.	280
2015	Dryden, E. C.	230
3032	Eskew, R. K.	247
2204	Filachione, E. M.	360
1022	Gaspari, D.	296
3116	Hills, C. H.	270
2025	Jasewicz, L. B. (Miss)	317
2019	Krider, M. M.	212
2034	Lothrop, R. E.	243
1013	McMeekin, T. L.	225
3122	Mellon, E. F.	363
2000	Naghski, J.	227
1030	Nutting, G. C.	285
1117	Ogg, C. L.	342
3128	Porter, W. L.	272
2015	Ratchford, W. P.	210
2012	Roberts, N. E.	214
2130	Silbert, L. S.	249
3015	Sills, M. W.	218
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3110	Stedman, R. L.	261
3104	Stirton, A. J.	256
1124	Susi, H.	340
3010	Swift, C. E.	385
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3015	Treadway, R. H.	209
2105	Wasserman, A. E.	355
2032	Wells, P. A.	242
2110	White, J. W., Jr.	350
2104	Willits, C. O.	351
1205	Windus, W.	217
1032	Witnauer, L. P.	226
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1004	Woodward, W. G. (Miss)	215
3101	Wrigley, A. N.	229
1100	Zittle, C. A.	332

**South Bldg.
Wash. 25, D. C.**

<u>Room</u>		DUDley 8-
0612	Pallansch, M. J.	2484
1655	Patterson, W. I.	2361
1669	Quigley, T. W., Jr.	6169
0125	Stevens, H.	2351
1639	Tittsler, R. P.	2465
1644	Webb, B. H.	2365

**Agr. Res. Center
Beltsville, Md.**

GRanite 4-4800

<u>Building No.</u>		<u>Extension</u>
200	Alford, J. A.	394
157	Edmondson, L. F.	582
200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394

OTHER UTILIZATION RESEARCH AND DEVELOPMENT DIVISIONS

NORTHERN

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Director

Dr. F. R. Senti

Fields of Research

Cereal grains: corn, wheat, barley, grain sorghum, and oats; oilseeds: soybean, flaxseed, safflower, and erucic acid-containing oilseeds; new crops.

SOUTHERN

Address and Telephone Number
 1100 Robert E. Lee Blvd. (P.O. Box 19687)
 New Orleans, La. 70119
 504-282-1441

Director

Dr. C. H. Fisher

Fields of Research

Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citrus, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts; new crops.

WESTERN

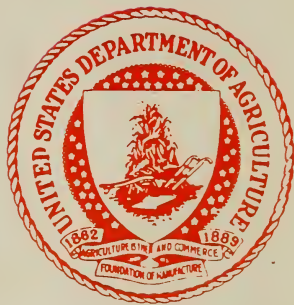
Address and Telephone Number
 800 Buchanan St.
 Albany, Calif. 94710
 415 Landscape 5-2244

Director

Dr. M. J. Copley

Fields of Research

Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat; barley; wool and mohair; sugar beets; dry beans and peas; castor beans; new crops.



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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

U. S. DEPT. OF AGRICULTURE
NATIONAL AGRICULTURAL LIBRARY

Wyndmoor APR 29 1965

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C & R-PREP.

600 East Mermaid Lane
Philadelphia, Pa. 19118
Telephone : 215 Chestnut Hill 7-5800

Washington Laboratories
South Building, USDA
14th St. & Independence Ave., S. W.
Washington, D. C. 20250
Telephone : 202 REpublic 7-4142

Beltsville Laboratories
Agricultural Research Center
Beltsville, Md. 20705
Telephone : 301 GRanite 4-4800

**Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE**

**U. S. Department of Agriculture
Agricultural Research Service**

Dr. B. T. Shaw
Administrator

Dr. F. R. Senti
Deputy Administrator
for Nutrition, Consumer, and
Industrial Use Research

**EASTERN UTILIZATION
RESEARCH AND DEVELOPMENT
DIVISION**

Dr. P. A. Wells
Director

In 1938, Congress authorized the construction of four Regional Research Laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 laboratories now known as the Eastern Utilization Research and Development Division.

Research is conducted in these Eastern Division laboratories on *animal products*: dairy, meats, fats, and leather; *plant products*: Eastern fruits and vegetables, tobacco, honey, maple, and new crops; and *allergens studies*.

Most of the laboratories where this work is done are located in the headquarters building at Wyndmoor, Pa., often referred to by its original name, the Eastern Regional Research Laboratory. Exceptions are the Dairy Products Laboratory, located in the South Building, U. S. Department of Agriculture, Washington, D. C., and at the Agricultural Research Center, Beltsville, Md.; the Meat Laboratory, located at Beltsville and Wyndmoor; and a special processing laboratory for potato products, located at East Grand Forks, Minnesota, which is the only Investigations Group of the Engineering and Development Laboratory not located at Wyndmoor.

For the locations and fields of research of other Nutrition, Consumer, and Industrial Use Research Divisions, see page 19.

February 1965

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OFFICE OF THE DIRECTOR

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Director

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Assistant Director, Program Operations

Dr. W. P. Ratchford
Assistant Director, Program Appraisal

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Assistant Director, Program Development

Dr. R. H. Treadway
Assistant Director, Industrial Development

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Marketing Research

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Miss W. G. Woodward
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N. E. Roberts
Public Information Officer

ADMINISTRATIVE MANAGEMENT

E. A. Connor
Assistant to Director for Management

Miss B. M. Deeny
Administrative Officer

PLANT MANAGEMENT

D. Gaspari
Mechanical Superintendent

*Washington, D. C.

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Chief: Dr. W. C. Ault

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: Dr. A. N. Wrigley

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Isomerization.* Studies are carried out on the isomerization of double bonds of unsaturated fatty acids and derivatives from animal fats.

3. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Polymerization mechanisms involved are studied, and the chemical reactions of the polymers are investigated.

4. *Structures of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: Vacancy

1. *Halogens.* Means of introducing halogens into fatty molecules are studied, and the mechanism of the reactions involved in stabilizing materials containing polymeric halogens is investigated.

2. *Alkylene Oxides.* Alkylene oxides are reacted with suitable fatty derivatives to make lubricant additives.

3. *New Lubricants.* New and useful products in the field of lubricants and lubricant additives are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives.

Detergents Investigations

Head: Dr. A. J. Stirton

1. *New Surface-Active Products.* Surface-active compounds made from suitable animal-fat derivatives are prepared and evaluated as detergents, wetting agents, emulsifiers, and similar products.

2. *Combination Detergents.* Detergents that are more efficient, or have a combination of useful properties, are sought by combining fat-derived compounds with soaps or other surface-active materials.

Exploratory Reactions Investigations

Acting Head: Dr. L. S. Silbert

1. *Activation Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats.

2. *Peroxides.* Peroxides are prepared from animal fats, and their properties, reactions, and applications are investigated.

3. *Metalloid Derivatives.* Metalloid derivatives are prepared from animal fats and their component fatty acids.

ANIMAL FAT PROPERTIES LABORATORY

Chief: Dr. L. P. Witnauer

The Animal Fat Properties Laboratory investigates the chemical composition and structure of animal fats and the vegetable fatty acids from some uncultivated plants, studies the molecular structure of such animal products as fats and hides and their derivatives, and determines their basic physical properties and evaluates potentially useful products made from them.

Chemical Composition and Structure Investigations

Head: R. W. Riemenschneider

1. *Methodology.* New and improved methods are developed for quantitatively fractionating and determining the fat components of meat fats, such as glycerides, fatty acids, cholesterol and esters, and phospholipids.

2. *Glycerides.* The principal glycerides of meat fats are isolated or synthesized so that their structure and physical behavior can be interrelated.

3. *Autoxidation of Fats.* Studies are made on the rate, extent, and products of autoxidation of pure unsaturated fatty acids and their derivatives as influenced by metal salts, amino acids, emulsifiers, antioxidants, etc.

4. *New Crop Seed Oils.* The epoxy fatty acids of oils obtained from uncultivated plants, which can be modified for use in plastic compositions, are isolated and their properties determined.

Physical Properties Investigations

Head: Dr. H. Susi

1. *Inter- and Intramolecular Structure.* The inter- and intramolecular structure of long-chain compounds found in or related to fats, of proteins such as collagen found in hides, and of pertinent model compounds is investigated by means of absorption spectroscopy, X-ray diffraction, and nuclear magnetic resonance methods.

2. *Special Techniques.* Special experimental techniques such as absorption spectroscopy at very low temperatures, studies on thin oriented films, and infrared measurements in aqueous solution are developed and adapted for investigating the structural characteristics of animal and other products in collaboration with other investigations groups.

3. *Molecular Characterization.* Molecular characteristics such as hydrogen bonding energies, rotational isomerisms, and normal vibrations of compounds derived from and related to animal products such as fats and hides are investigated by applying experimental techniques in conjunction with theoretical calculations.

Product Properties Evaluation Investigations

Head: Vacancy

1. *Fundamental Properties.* The mechanical, electrical, thermal, and solution properties of animal products such as native and modified collagen and polymeric substances derived from fats are studied and the results are interpreted on a molecular basis.

2. *Special Techniques.* Mechanical and electrical measurement, electron microscopy, light scattering, electrophoresis, differential thermal analysis, and rheological techniques are applied and new methods and apparatus are developed to study the properties of animal and other products.

3. *Evaluation of New Compositions.* Compositions based on animal products such as fats and hides are evaluated through studies of their mechanical behavior and thermal stability by conventional test methods to determine their potential use as plastics, plasticizers, foams, leathers, etc.

DAIRY PRODUCTS LABORATORY

Chief: Dr. B. H. Webb (Washington, D. C.)

The work of the Dairy Products Laboratory falls within five principal investigation areas. These are concerned with the study of dried milk products, fluid milk concentrates, cheese and butterfat, dairy processing equipment, and milk flavor.

Dried Milk Products Investigations

Head: Dr. M. J. Pallansch
(Washington, D. C.)

1. *Chemistry.* The fundamental chemistry of dried milk products and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved dried milk products is undertaken.

3. *New Products and Uses.* New and improved products are developed and methods are explored for increasing the use of dried milk in bakery goods.

4. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting basic investigations of dried milk products are developed and improved.

Fluid Concentrated Milk Investigations

Head: Dr. L. F. Edmondson
(Washington, D. C.)

1. *Chemistry.* The chemistry of fluid concentrated milks and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved sterile, sweetened-condensed, and frozen concentrated milks is undertaken.

3. *Product Improvement.* Ion-exchange and electro-dialysis techniques are experimented with for improving fluid concentrated milk products.

4. *Evaluation.* Chemical and physical methods and instrumentation for conducting investigations of concentrated milks are developed and improved.

Cheese and Butterfat Investigations

Head: Dr. R. P. Tittsler
(Washington, D. C.)

1. *Chemistry.* The fundamental chemistry of cheese, butter and butter oil, and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved cheeses, butter, butter oil, and related products is undertaken.

3. *Microbiology.* The microbiology of milk, cheese, butter, and cultured milk products is studied.

4. *Whey.* New or improved products from whey are sought by a study of the microbiology, chemistry, biochemistry, and technology of this dairy byproduct.

5. *Evaluation.* Microbiological and chemical methods and instrumentation for conducting investigations of cheese, butter, whey, and cultured milk products are developed and improved.

Dairy Processing Equipment Investigations

Head: F. P. Hanrahan
(Washington, D. C.)

1. *Design Data.* Fundamental data are obtained as a basis for the design of more efficient equipment for the processing of dairy products.

2. *Specialized Equipment.* New and improved specialized equipment is developed and designed.

3. *Pilot-plant Equipment.* Practical pilot-plant equipment is developed and designed.

4. *Commercial Processing.* Plans and cost estimates are developed for large-scale commercial processing.

Milk Flavor Investigations

Head: (Vacancy)

1. *Flavor Constituents.* The individual constituents of milk flavor are isolated, purified, and identified.

2. *Flavor Formation.* The mechanism of flavor formation in dairy products is determined.

3. *Laboratory Studies.* Basic laboratory procedures are developed for removing undesirable flavors, preserving desirable flavors, and preventing the formation of off-flavors in milk and milk products.

4. *Taste Panels.* Statistically valid sensory tests are developed and correlated with objective tests used to measure changes in flavor of milk and milk products.

5. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting investigations of milk flavor are developed and improved.

MILK PROPERTIES LABORATORY

Chief: Dr. G. C. Nutting

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of this work is directly related to the effects of processing on milk properties. Most of this work relates to the proteins and enzymes of milk.

Biochemical Properties Investigations

Head: Dr. C. A. Zittle

1. *Milk Enzymes.* The basic chemistry of milk enzymes is studied and methods are developed for their purification and characterization.

2. *Protein Structure.* Purified proteins are split by specific proteolytic enzymes to peptide fragments, and these fragments are studied to determine their amino acid sequence and fine structure.

3. *Reactions of Milk Proteins and Salts.* The effect of heat on milk proteins in the presence of milk salts is determined.

4. *Interaction of Components.* The interaction between the various components of milk is evaluated.

5. *Basic Studies Related to Storage of Concentrated Milks.* Better resistance of concentrated milks to fat separation and gelation on storage is sought through the development of basic information.

Physical-Chemical Properties Investigations

Head: Dr. S. N. Timasheff

1. *Molecular-Kinetic Properties of Milk Proteins in Solution.* Such phenomena are studied as aggregation-dissociation, structural transformations, binding of small molecules and ions, and genetic differences.

2. *Inter-Molecular Forces.* The forces acting between protein and other molecules are investigated, as are the specificity of the forces and the nature of the processes that take place at particular interaction sites.

3. *Special Techniques.* Ultracentrifugal, electrophoretic, light-scattering, and radioactive-tracer techniques are applied in collaboration with other investigations groups within the Division.

4. *Macromolecular Studies.* Thermodynamics and statistical mechanics of macromolecules are studied.

MEAT LABORATORY

Chief: W. L. Sulzbacher
(Beltsville, Md.)

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and developing better methods of handling, preserving, and processing meats. These investigations are carried out in the areas of composition and quality, flavor, microbiology, and product stability.

Composition and Quality Investigations

Head: C. E. Swift (Wyndmoor, Pa.)

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats so that the products obtained will have more tenderness and juiciness and better color, and so that meats from all commercial grades and cuts will be utilized to their optimum.

Meat Flavor Investigations

Head: Dr. A. E. Wasserman
(Wyndmoor, Pa.)

1. *Flavor Precursors.* Meat flavor precursors and compounds are isolated and characterized, and then modification by processing techniques is studied.

2. *Wood Smokes.* The wood smokes used in meat processing are studied to determine their chemical composition and the interaction of their components with meat constituents.

3. *Taste Studies.* Meats, meat products, and chemical components of meat flavors are evaluated organoleptically.

4. *Improvement in Meat Flavor.* Results of these flavor studies are applied to the production of new and improved meat products.

Microbiology Investigations

Head: Dr. J. A. Alford (Beltsville, Md.)

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are developed.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures or during meat processing, and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

Product Stability Investigations

Head: A. M. Gaddis (Beltsville, Md.)

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

3. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

4. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

HIDES AND LEATHER LABORATORY

Chief: Dr. J. Naghski

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: Dr. E. F. Mellon

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, and purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: Dr. E. M. Filachione

1. *Protein Complex in Hides.* Basic principles relating to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: Dr. W. Windus

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers and other hide products with new and extended industrial uses.

2. *New Unhairing Methods.* Chemicals and enzymes are being applied experimentally in the development of more rapid and economical unhairing and treating processes.

3. *Mineral Tannages.* Leather with improved resistance to deterioration is sought through the study of mineral tannages.

4. *Combination Tannages.* Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

5. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leathers tanned by these materials.

6. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to the Industry to permit the translation of laboratory discoveries to practical applications.

PLANT PRODUCTS LABORATORY

Chief: Dr. C. F. Woodward

The Plant Products Laboratory undertakes investigations on five specific plant products or groups of products, and also does analytical chemical research on these plants as well as on the composition of other agricultural commodities assigned to the Eastern Division. The five areas of investigation on plant products concern fruits, potatoes and other vegetables, honey, maple sirup, and tobacco.

Fruit Investigations

Head: Dr. C. H. Hills

1. *Study of Components.* This work is isolating and identifying the organic constituents of deciduous fruits. Of particular interest are those components that affect the color, flavor, aroma, and texture of raw and processed fruit products.

2. *Improvement in Processing.* Basic information on fruit constituents—their starch, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Preprocessing Quality.* The influence of variety, cultural practices, and preprocessing treatments on the quality of processed fruit products is studied.

4. *New Products.* An extended use of Eastern deciduous fruits is sought through the development of new food and industrial products that can be made from them.

Potato and Other Vegetable Investigations

Head: Dr. W. L. Porter

1. *Study of Components.* This work is isolating and identifying the constituents of potatoes and other vegetables. Of particular interest are those components that produce and control the color, flavor, and texture in fresh and processed products.

2. *Improvement in Processing.* Basic information on the constituents of potatoes and other vegetables—their starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Preprocessing Quality.* The influence of varieties, cultural practices, and storing conditions on the quality of potato and other vegetable products is studied.

4. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

Honey Investigations

Head: Dr. J. W. White, Jr.

1. *Composition.* The composition of all domestic floral types of honey is studied, and the carbohydrates, acids, nitrogenous compounds, and other components having possible biological activity are isolated, identified, and determined quantitatively.

2. *New and Improved Processes and Products.* Extended and improved uses for honey are sought through the development of new processes and products.

3. *New Analytical Techniques.* New methods of analysis applicable to honey utilization are developed.

4. *Beeswax.* The constituents of domestic beeswax related to quality are identified as an aid to improved refining of this apiary product.

Maple Investigations

Head: Dr. C. O. Willits

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and of maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Products from Maple.* Improved and extended industrial uses of maple sirup are sought through the development of new processes and products.

Tobacco Investigations

Head: Dr. R. L. Stedman

1. *Determination of Compounds.* The alkaloidal, polyphenolic, and resinous components of tobacco, which contribute to leaf quality or might otherwise be of significance in the overall utilization of tobacco, are isolated and characterized. New procedures are developed for separating, characterizing, and quantitatively determining these compounds.

2. *Industrial Uses.* New or extended industrial uses for these compounds are developed.

3. *Smoke Constituents.* The chemical components of tobacco smoke are isolated and characterized, and the information is applied to the solution of problems in tobacco utilization.

4. *New Products.* New and improved tobacco products are developed by the application of information obtained through this research.

Special Plant Investigations

Head: Dr. C. L. Ogg

1. *Plant Screening.* *Vernonia anthelmintica* and other possible new crops under agronomic study are screened for quality and yield of constituents of economic interest.

2. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed and improved for the conduct of various investigations in the Division.

3. *Collaborative Studies.* Collaborative studies are conducted to determine the accuracy and precision of physical and chemical methods.

4. *Microanalytical and Mass Spectrometric Studies.* Microanalytical and mass spectrometric work is conducted for all laboratories of the Division.

ENGINEERING and DEVELOPMENT LABORATORY

Chief: R. K. Eskew

The Engineering and Development Laboratory, which originates, evaluates, and develops new processes on a pilot-plant scale, is working in five investigation areas. Two of these are concerned with the development of new and improved products from animals and plants. The third is devoted to existing commercial processes for making potato products, and considers the adaptability to these processes of new and experimental potato varieties. In the fourth investigation area, cost and design information are developed, and in the fifth, unit operations are conducted to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Head: N. C. Aceto

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on the commercialization of developments.

Plant Products Engineering Investigations

Head: J. Cording, Jr.

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on the commercialization of developments.

Potato Products Investigations

Head: R. L. Shaw, Jr.

(East Grand Forks, Minnesota)

1. *Processing Quality.* Varietal, cultural, storage, and other source factors are evaluated for their effect on the quality of commercial forms of processed potatoes.

2. *Composition of New Varieties.* The gross composition of new and experimental potato varieties is related to established processing methods and quality of products.

3. *Processing Potential from New Varieties.* Laboratory methods are devised and developed to screen new and experimental varieties of potatoes for their processing potential.

4. *Pilot-Plant Operations.* Integrated pilot plants are planned and operated to accurately foretell the effects of the cultural and varietal factors on a commercial scale.

5. *Product Evaluation.* Products are evaluated by appropriate subjective and objective methods.

Cost and Design Engineering Investigations

Head: Vacancy

1. *Preliminary Cost Estimates.* To help determine the advisability of operating a proposed process on a pilot-plant scale, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive cost estimates are made for the commercial production and distribution of new products made from plant and animal commodities as a basis for determining their economic feasibility.

3. *Pilot-Plant Design and Assembly.* Integrated pilot plants are designed and assembled for obtaining engineering data for cost estimates.

4. *Advice to Industry.* Information is obtained for advice to industry on the design of commercial units for processes developed by the Laboratory.

5. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

Unit Operations Engineering Investigations

Head: H. I. Sinnamon

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* These fundamental findings are related to practical pilot-plant operation.

PIONEERING RESEARCH LABORATORIES

PIONEERING RESEARCH LABORATORY FOR ANIMAL PROTEINS

Chief Research Chemist: Dr. T. L. McMeekin

This Laboratory undertakes pioneering studies in the field of animal proteins. Its investigations encompass such considerations as the isolation, characterization, structure, properties, and reactions of animal proteins. New information is being developed in this Laboratory which is advancing the scientific knowledge of proteins and leading to new scientific principles and methods.

PIONEERING RESEARCH LABORATORY FOR ALLERGENS IN AGRICULTURAL PRODUCTS

Principal Research Biochemist:

Dr. H. Stevens (Washington, D. C.)

This Laboratory undertakes fundamental scientific investigations on the chemistry and immunology of allergens in agricultural products. These studies are concerned with the isolation and identification of the chemical and physiological properties of the allergens of food and industrial products derived from farm products, as well as with establishing the basic mechanisms whereby these materials produce the allergic response in man. The work of this Laboratory in the little-known field of immunochemistry is contributing to the general health of our people and is useful in pointing to methods of processing agricultural products so as to minimize their allergic effects.

DIRECTORY

<u>Location</u>	<u>Name</u>	<u>Telephone</u>
		215 CHestnut Hill
Wyndmoor, Pa.		7-5800
Room		Extension
3034	Aceto, N. C.	374
3006	Ault, W. C.	244
2026	Connor, E. A.	240
3024	Cording, J., Jr.	280
2026	Deeny, B. M. (Miss)	241
2015	Dryden, E. C.	230
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Agr. Res. Center Beltsville, Md.

301 GRanite 4-4800

Building No.		Extension
200	Alford, J. A.	394
200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394

Other Divisions of
NUTRITION, CONSUMER, AND
INDUSTRIAL USE RESEARCH

**Agricultural Research Service,
U. S. Department of Agriculture**

**Northern Utilization Research and Development
Division**

1815 N. University St.
Peoria, Ill. 61604
Phone 309-685-4011
Dr. R. J. Dimler, Director
Cereal grains: corn, wheat, barley, grain
sorghum, and oats; oilseeds: soybean, flax-
seed, and erucic acid-containing oilseeds;
new crops.

**Southern Utilizaion Research and Development
Division**

1100 Robert E. Lee Blvd. (P.O. Box 19687)
New Orleans, La. 70119
Phone 504-282-1441
Dr. C. H. Fisher, Director
Cotton and cottonseed; tung fruit; pine
gum; Southern fruits and vegetables, in-
cluding citrus, sweetpotatoes, and cucum-
bers; sugarcane; rice; peanuts; new crops.

**Western Utilization Research and Development
Division**

800 Buchanan St.
Albany, Calif. 94710
Phone 415 LAndscape 5-2244
Dr. M. J. Copley, Director
Western fruits, nuts, vegetables, and rice;
poultry products; forage crops; wheat;
barley; wool and mohair; sugar beets; dry
beans and peas; castor beans; safflower;
new crops.

Clothing and Housing Research Division

Agricultural Research Center
Beltsville, Md. 20705
Phone 301 GRanite 4-4800, Ext. 326
Dr. Esther L. Batchelder, Director
Consumers' needs for clothing and housing;
performance and household use of fabrics
and equipment; functional design to solve
special problems.

Consumer and Food Economics Research Division

Federal Center Bldg.
Hyattsville, Md. 20781
Phone 202 DUDley 8-8451
Dr. Faith Clark, Director
Levels of living as determined by surveys;
nutritional appraisal of diets and food sup-
plies; problems of household management.

Human Nutrition Research Division

Agricultural Research Center
Beltsville, Md. 20705
Phone 301 GRanite 4-4800, Ext. 337
Dr. Willis A. Gortner, Director
Metabolic processes and nutritional require-
ments of man; nutritive and other consumer
values of food.



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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

★Wyndmoor, Pa.

MAILING ADDRESS:

**600 E. Mermaid Lane
Philadelphia, Pa. 19118
215 Chestnut Hill 7-5800**

OTHER LABORATORIES AND FIELD STATIONS:

★ Washington, D. C.

★ Beltsville, Md.

★ E. Grand Forks, Minn.

★ Lexington, Ky.

★ Waltham, Mass.

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for Nutrition, Consumer, and
Industrial Use Research

EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

Dr. P. A. Wells
Director

In 1938, Congress authorized the construction of four Regional Research Laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 Laboratories now known as the Eastern Utilization Research and Development Division.

Research is conducted in these Eastern Division laboratories on animal products: dairy, meats, fats, and leather; and plant products: Eastern fruits and vegetables, tobacco, and maple.

Most of the laboratories where this work is done are located in the headquarters building at Wyndmoor, Pa., often referred to by its original name, the Eastern Regional Research Laboratory. Exceptions are the Dairy Products Laboratory, located in the South Building, U. S. Department of Agriculture, Washington, D. C., and the Agricultural Research Center, Beltsville, Md.; the Meat Laboratory, at Beltsville and Wyndmoor; the Potato Products Investigations, in East Grand Forks, Minnesota; the Kentucky Cooperative Tobacco Investigations, at the University of Kentucky, Lexington; and the Pioneering Research Laboratory of Physical Biochemistry, at Brandeis University, Waltham, Massachusetts. For addresses, see page 25.

For the locations and fields of research of other Nutrition, Consumer, and Industrial Use Research see page 28.

January 1968

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OFFICE OF THE DIRECTOR

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Acting Assistant Director,
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D. B. Moyer
Administrative Officer

G. A. Corrigan
Personnel Officer

PLANT MANAGEMENT

D. Gaspari
Mechanical Superintendent

*Washington, D. C.

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Acting Chief: DR. A. N. WRIGLEY

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: DR. A. N. WRIGLEY

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Copolymerization mechanisms and parameters are studied and evaluated, and the physical-chemical characteristics of the copolymers are investigated.

3. *Structure of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: DR. G. MAERKER

1. *New Lubricant Components.* New fatty chemicals useful as lubricant components are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives. New products are evaluated as base oils, additives, grease thickeners, etc.

2. *Alkylene Oxides and Imines.* The reactions of fat-derived epoxides and aziridines are studied in detail and their mechanisms explored for the purpose of preparing suitable lubricant components. Reaction products are further modified in the light of test results.

Detergents Investigations

Head: DR. A. J. STIRTON

1. *Biodegradability.* Detergents and surface-active agents from animal fats are investigated for ease of biodegradation under both aerobic and anaerobic conditions.

2. *Synthesis and Evaluation.* New detergents and surface-active agents are synthesized from animal fats and evaluated for detergent, foaming, wetting, emulsifying, and other properties. Combinations with soap or other detergents or surface-active agents are investigated for household or industrial use.

Exploratory Reactions Investigations

Head: DR. L. S. SILBERT

1. *Activation Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats. Unusual rearrangements and reaction mechanisms are explored.

2. *Peroxides.* Peroxides are prepared from animal fats, and their chemical and physical properties and applications are investigated.

3. *New Chemical Intermediates.* Animal fats are further modified by the introduction of reactive ester, sulfur, and other functional groups in order to synthesize new chemical intermediates.

MEAT LABORATORY

*Chief: W. L. SULZBACHER**

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and developing better methods of handling, preserving, and processing meats. The investigations are carried out in the areas of composition and quality, flavor, microbiology, and product stability.

Composition and Quality Investigations

Head: C. E. SWIFT

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats so that the products obtained will have more tenderness and juiciness and better color, and so that meats from all commercial grades and cuts will be utilized to their optimum.

*Beltsville, Md.

Meat Flavor Investigations

Head: DR. A. E. WASSERMAN

1. *Flavor Precursors.* Meat flavor precursors and compounds are isolated and characterized, and then their modification by processing techniques is studied.

2. *Wood Smokes.* The wood smokes used in meat processing are studied to determine their chemical composition and the interaction of their components with meat constituents.

3. *Flavor Chemistry.* The chemical precursors of meat flavor are identified and their reactions to form flavorful compounds are investigated both chemically and organoleptically.

4. *Improvement in Meat Flavor.* Results of these flavor studies are applied to the production of new and improved meat products.

Microbiology Investigations

*Head: DR. J. A. ALFORD**

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are developed.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures or during meat processing, and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

Product Stability Investigations

*Head: A. M. GADDIS**

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

3. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

*Beltsville, Md.

4. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

HIDES AND LEATHER LABORATORY

Chief: **DR. J. NAGHSKI**

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: **DR. E. F. MELLON**

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: DR. E. M. FILACHIONE

1. *Protein Complex in Hides.* Basic principles related to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: DR. W. WINDUS

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers with new and extended industrial uses. Food uses are sought for collagen, the protein constituent of hide.

2. *Mineral Tannages.* Leather with improved resistance to deterioration is sought through the study of mineral tannages.

3. *Combination Tannages.* Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

4. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leather tanned by these materials.

5. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to industry to permit the translation of laboratory discoveries to practical applications.

DAIRY PRODUCTS LABORATORY

Chief: **DR. B. H. WEBB***

The work of the Dairy Products Laboratory falls within six principal investigation areas. These are concerned with the study of dried milk products, fluid milk concentrates, cheese and butterfat, dairy processing equipment, milk flavor, and allergens in milk.

Dried Milk Products Investigations

Head: **DR. M. J. PALLANSCH***

1. *Chemistry.* The fundamental chemistry of dried milk products and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved dried milk products is undertaken.

3. *New Products and Uses.* New and improved products are developed and methods are explored for increasing the use of dried milk in bakery goods.

4. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting basic investigations of dried milk products are developed and improved.

Fluid Concentrated Milk Investigations

Head: **DR. L. F. EDMONDSON***

1. *Chemistry.* The chemistry of fluid concentrated milks and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved sterile, sweetened-condensed, and frozen concentrated milks is undertaken.

3. *Product Improvement.* Ion-exchange and electrodialysis techniques are experimented with for improving fluid concentrated milk products.

4. *Evaluation.* Chemical and physical methods and instrumentation for conducting investigations of concentrated milks are developed and improved.

*Washington, D. C.

Cheese and Butterfat Investigations

Acting Head: DR. B. H. WEBB*

In Charge of Pilot Plant Research:

H. E. WALTER†

1. *Chemistry.* The fundamental chemistry of cheese, butter, and butter oil, and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved cheeses, butter, butter oil, and related products is undertaken.

3. *Microbiology.* The microbiology of milk, cheese, butter, and cultured milk products is studied.

4. *Whey.* New or improved products from whey are sought by a study of the microbiology, chemistry, biochemistry, and technology of this dairy byproduct.

5. *Evaluation.* Microbiological and chemical methods and instrumentation for conducting investigations of cheese, butter, whey, and cultured milk products are developed and improved.

Dairy Processing Equipment Investigations

Acting Head: DR. B. H. WEBB*

1. *Design Data.* Fundamental data are obtained as a basis for the design of more efficient equipment for the processing of dairy products.

2. *Specialized Equipment.* New and improved specialized equipment is developed and designed.

3. *Pilot-Plant Equipment.* Practical pilot-plant equipment is developed and designed.

4. *Commercial Processing.* Plans and cost estimates are developed for large-scale commercial processing.

Milk Flavor Investigations

Head: DR. O. W. PARKS*

1. *Flavor Constituents.* The individual constituents of milk flavor are isolated, purified, and identified.

2. *Flavor Formation.* The mechanism of flavor formation in dairy products is determined.

3. *Laboratory Studies.* Basic laboratory procedures are developed for removing undesirable flavors, preserving desirable flavors, and preventing the formation of off-flavors in milk and milk products.

4. *Taste Panels.* Statistically valid sensory tests are developed and correlated with objective tests used to measure changes in the flavor of milk and milk products.

5. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting investigations of milk flavor are developed and improved.

†Beltsville, Md.

*Washington, D. C.

Allergens Investigations

DR. E. J. COULSON*

1. *Incidence of Milk Allergy.* The incidence of allergy to the known proteins of milk is determined.

2. *Isolation and Purification of Milk Allergens.* Allergens from fluid milk are isolated and purified and their homogeneity established by physical, chemical and immunological characterization.

3. *Chemical Groups Responsible.* Specific chemical groups responsible for allergic and immunological reactions are determined.

4. *Deallergenization Methods.* Methods for de-allergenizing milk are determined.

MILK PROPERTIES LABORATORY

Chief: DR. G. C. NUTTING

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of the work is directly related to the effects of processing on milk properties. Most of the research relates to the proteins and enzymes of milk.

Isolation and Purification Investigations

Head: DR. C. A. ZITTLE

1. *Separation Methods.* Means are sought to isolate, purify, and characterize the caseins and whey proteins, lipoproteins, and enzymes and other quantitatively minor "leakage" proteins originating in milk-secreting cells and in the blood-vascular system.

2. *Polymorphism.* Genetic and metabolic polymorphism of the principal milk proteins among breeds and bloodlines is investigated.

*Washington, D. C.

3. *Casein Complexes.* Compositional and structural relationships among casein micelles are sought. Association of ions ("milk salts") with the major protein species in molecular complexes, micelles, and larger aggregates is determined.

4. *Enzyme Effects.* Effects of "natural" proteolytic and other milk enzymes on the properties of milk and its components are studied.

5. *Fat Globule Membranes.* Milk fat globule membranes, both natural and artificial, are investigated to determine their chemical nature and the mechanism whereby emulsions of milk fat are stabilized.

6. *Processing Properties.* Changes in milk properties upon processing (heating, concentrating, drying, freezing) are correlated with the molecular and micellar makeup of the proteins.

Structure and Composition Investigations

Head: DR. W. G. GORDON

1. *Amino Acid Analyses.* Amino acid analyses are made on major and minor milk proteins, including enzymes; on chemically modified proteins; on proteoses and peptones of milk; and on peptides made by selective enzymatic degradation of proteins.

2. *Modification of Pure Proteins.* Selected pure milk proteins are subjected to controlled chemical modification to determine their topochemical behavior and effects on their molecular association in solution.

3. *Primary Structure.* Amino acid sequence is determined on peptides of unusual interest, such as "difference peptides" from genetic polymorphs of milk proteins; and at the ends of the peptide chain of undegraded protein molecules.

Physical-Chemical Investigations

Acting Head: DR. G. C. NUTTING

1. *Molecular Structure of Proteins.* Molecules and aggregates of the principal milk proteins and their genetic polymorphs are investigated to determine their secondary and tertiary structure, and this is correlated with their amino acid composition, peptide composition, and amino acid sequence.

2. *Molecular Behavior of Proteins.* Explanations of molecular behavior of milk proteins are sought in terms of their bond types, energy and entropy effects, and local geometry.

3. *Protein Interaction.* The interaction of selected milk proteins with ions and small molecules is studied.

PLANT PRODUCTS LABORATORY

Chief: DR. J. W. WHITE, JR.

The Plant Products Laboratory undertakes investigations on Eastern fruits and vegetables including potatoes, and maple sap and sirup, and also does analytical chemical research on these products as well as on the composition of other agricultural commodities assigned to the Eastern Division. There are five areas of investigation: fruits, potatoes and other vegetables, potato products, maple, and special plants.

Fruit Investigations

Head: DR. C. H. HILLS

1. *Study of Components.* The organic constituents of deciduous fruits are isolated and identified. Components that affect the color, flavor, aroma, and texture of processed fruit products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of fruits and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Processing Quality.* The influence of variety, cultural practices, mechanical harvesting, and pre-processing treatments on the quality of processed fruit products is studied.*

4. *New Products and Processes.* An extended use of Eastern deciduous fruits is sought through the development of new food products and processes.

*In cooperation with the Crops Research Division, ARS, and with State Experiment Stations.

5. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Potato and Other Vegetable Investigations

Head: DR. W. L. PORTER

1. *Study of Components.* The individual components of potatoes and other vegetables are isolated and identified. Those components that produce and control the color, flavor, texture, and storage properties of processed products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of potatoes and other vegetables and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Varieties and Cultural and Storage Practices.* The influence of varieties and cultural and storage practices on the quality of potato and other vegetable products is studied.*

4. *Potato-Processing Wastes.* The feasibility of extracting useful substances from potato-processing wastes is studied as a means of reducing environmental pollution.

5. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Maple Investigations

Head: DR. C. O. WILLITS

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

*In cooperation with the Crops Research and Market Quality Research Divisions, ARS.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Processes and Products from Maple.* Improved and extended industrial uses of maple sirup are sought by developing new processes and products.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation for the conduct of these investigations are developed and improved.

Potato Products Investigations*

Head: R. L. SHAW, JR.

1. *Varieties and Cultural Practices.* The influence of varieties and cultural factors on the quality of commercial forms of processed potatoes is studied.†

2. *Storage.* The influence of storage environment on the quality of commercial forms of processed potatoes is studied.‡

3. *Composition of New Varieties.* The gross composition of new and experimental potato varieties is related to established processing methods and quality of products.†

4. *Processing Potential of New Varieties.* Laboratory methods are devised and developed to screen new and experimental varieties of potatoes for their processing potential.†

5. *Pilot-Plant Operations.* Integrated pilot plants are planned and operated to accurately foretell the effects of the cultural and varietal factors on a commercial scale.

6. *Product Evaluation.* Products are evaluated by appropriate subjective and objective methods.

Special Plant Investigations

Head: DR. C. L. OGG

1. *Evaluation Methods.* Chemical and physical methods for the evaluation of commodities under investigation in various Laboratories of the Division are developed and improved.

2. *Electronic Instrumentation.* Electronic instrumentation is developed for the conduct of research by the various investigations in the Division.

3. *Flavor Research.* Flavors and flavor precursors in plant products are identified.

4. *Special Analytical Techniques.* Microanalytical, mass spectrometric, and gas chromatographic techniques are applied to products of all Laboratories of the Division.

*East Grand Forks, Minnesota. Operated in cooperation with the Minnesota and North Dakota Agricultural Experiment Stations and the Red River Valley Potato Growers Association.

†In cooperation with the Crops Research Division, ARS.

‡In cooperation with the Market Quality Research Division, ARS.

5. *Collaborative Studies.* Chemical and physical methods are evaluated in collaboration with outside laboratories.

TOBACCO LABORATORY

Chief: DR. C. F. WOODWARD

The Tobacco Laboratory does research on leaf and smoke constituents and on tobacco products aimed at improving their quality and minimizing or eliminating any harmful biological effects that may be associated with smoking. Investigations are conducted on cigar and cigarette smoke, tobacco leaf, leaf processing, and pyrolysis, and special cooperative research is carried on at the University of Kentucky on health-related aspects of smoking.

Smoke Investigations

Head: DR. R. L. STEDMAN

1. *Smoke Quality.* The constituents of smoke that contribute to flavor, aroma, and biological activity are isolated and identified.

2. *Analytical Methods.* Improved methods are developed to isolate and determine components of major organoleptic and biological importance.

3. *Smoke Fractionation.* Constituents and fractions of smoke are prepared for biological evaluation.

4. *Correlation of Smoke Components and Quality.* The composition of smoke is correlated with its flavor, aroma, and physiological characteristics.

Leaf Investigations

Head: DR. O. T. CHORTYK

1. *Leaf Quality.* The leaf constituents responsible for the flavor, aroma, and biological activity of smoke are isolated and identified.

2. *Leaf Composition and Quality.* The relationships between leaf composition and the flavor, aroma, and biological characteristics of smoke are evaluated.

3. *Variations in Tobacco Types.* Differences in constituents of various tobacco types are determined.

4. *Biological Preparations.* Leaf compounds and fractions are prepared for biological tests.

Leaf Processing Investigations

Head: DR. A. I. SCHEPARTZ

1. *Tobacco Fermentation.* The microflora involved in tobacco fermentation are isolated and identified.

2. *Enzymes.* The enzymes elaborated by the principal microflora are determined.

3. *Processing Methods.* Improved methods for processing tobacco leaf are developed.

4. *Processing Treatment and Quality.* The flavor, aroma, and physiological characteristics of tobaccos from various processing treatments are correlated.

Pyrolysis Investigations

Head: DR. I. SCHMELTZ

1. *Pyrolytic Products.* Pyrolytic products of tobacco leaf constituents are determined.

2. *Burn-Temperature Modification.* Tobacco additives are sought that will change the burn temperature.

3. *Smoke Formation.* The basic physico-chemistry of the smoke-forming process is investigated.

4. *Removal of Smoke Constituents.* Techniques are developed to selectively remove smoke constituents.

Kentucky Cooperative Tobacco Investigations*

Head: DR. D. BURDICK

1. *Modification of Products.* Smoking products are developed with physical and chemical properties altered by the use of chemical modifiers and tobaccos of different cultural histories.

2. *Analytical Methods.* New and improved analytical methods are developed for the detection and determination of tobacco leaf and smoke constituents of physiological importance.

3. *Bio-Assays.* Tobacco leaf and smoke constituents are bio-assayed, and more efficient bio-assay procedures are developed for this work.

*Lexington, Kentucky

PHYSICAL CHEMISTRY LABORATORY

Chief: **DR. L. P. WITNAUER**

The Physical Chemistry Laboratory is concerned with the determination of molecular structures, the development and application of mathematical procedures, the measurement of physical properties, and the investigation of the principles and techniques of separation science. The basic studies are applied to the constituents of and products from hides, fats, milk, meat, and other commodities assigned to the Division.

Molecular Structure Investigations

Head: **DR. H. SUSI**

1. *Physical Techniques.* Absorption spectroscopy, X-ray diffraction, NMR spectroscopy, and other physical techniques are applied to develop information concerning the inter- and intramolecular structure of the constituents of hides, fats, meat, milk, and other products, and of pertinent model systems.

2. *Experimental and Mathematical Techniques.* Specialized experimental and mathematical techniques are developed and applied for structural studies, such as investigations on isotopically substituted molecules, precise measurements in aqueous solutions, investigations with polarized radiation, and adaptation of recent theoretical advances for solving specific problems.

3. *Relationship Between Structure and Properties.* Inter- and intramolecular parameters, such as hydrogen-bond energies, rotational barriers, molecular force constants, and the form of normal vibrations, as revealed through experimental studies in conjunction with pertinent calculations, are related to the chemical and physical characteristics of the products under investigation.

4. *Collaborative Studies.* Consultations and collaborative studies are carried out involving molecular spectroscopy and molecular structure.

Mathematical Investigations

Head: DR. C. R. EDDY

1. *Calculation of Molecular Data.* Mathematical methods and computer-based procedures are developed for obtaining basic molecular information from experimental measurements to assist research on milk, meat, animal fats, potatoes, tobacco, and hides.

2. *Calculation of Material Properties.* Computer-based procedures are developed for obtaining information on properties of materials above the molecular level from experimental measurements such as dielectric properties, dynamic mechanical behavior, and X-ray diffraction for use in research on animal fats, milk constituents, and hides.

3. *Theoretical Computation of Molecular Properties.* Internal molecular properties not readily accessible to experimental measurements are computed theoretically for application to constituents of, and products from, animal fats, hides, milk, meat, and maple sap.

4. *Consultations and Service.* Mathematical consultations and general computer services are provided.

Physical Properties Investigations

Acting Head: DR. L. P. WITNAUER

1. *Application of Existing Techniques.* Light scattering, osmotic pressure, ultracentrifugation, electron microscopy, electrophoresis, differential thermal analysis, rheometry, and mechanical, electrical, and other techniques are applied to determine the physical properties of, constituents of, and products from, such commodities as hides, animal fats, milk, and meat.

2. *New Techniques.* Such new techniques and apparatus as electrical birefringence and light scattering in an electric field are developed as needed for basic physical characterization of the constituents of various products.

3. *Evaluation Studies.* Components and derivatives of such products as hides and fats are evaluated through examination of their mechanical and thermal properties and other characteristics important to their potential usefulness as films, fibers, thickeners, and surface-active agents.

4. *Collaborative Studies.* Consultation and collaborative studies are carried out involving physical properties.

Separations and Composition Investigations

Head: DR. H. L. ROTHBART

1. *Separation Techniques.* Chromatography, countercurrent distribution, zone refining, and other separation techniques are studied to develop information about the composition of such products as animal fats, meat, milk, and tobacco.

2. *Principles of Separation Processes.* The basic principles underlying separation processes, including equilibrium and transport phenomena, are determined in order to develop the mathematical representations required to predict efficient separations of components of various products.

3. *New and Improved Separation Procedures.* New and improved methods and instrumentation are developed for the separation of components of various products.

4. *Stability Investigations.* The factors that affect the stability of animal fats and other food products are determined.

5. *Collaborative Studies.* Consultations and collaborative studies are carried out with other research units on problems in separation science.

ENGINEERING AND DEVELOPMENT LABORATORY

Acting Chief: N. C. ACETO

The Engineering and Development Laboratory, which originates, evaluates, and develops new processes on a pilot-plant scale, is working in four investigation areas. Two of these are concerned with the development of new and improved products from animals and plants. In the third investigation area, cost and design information is developed, and in the fourth, unit operations are conducted to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Head: N. C. ACETO

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on commercialization of developments.

Plant Products Engineering Investigations

Head: J. CORDING, JR.

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on commercialization of developments.

Unit Operations Engineering Investigations

Head: H. I. SINNAMON

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* Fundamental findings are related to practical pilot-plant operation.

Cost and Design Engineering Investigations

Head: W. K. HEILAND

1. *Preliminary Cost Estimates.* To help determine the advisability of pilot-plant operation of a proposed process, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive cost estimates are made for the commercial production and distribution of new products made from plant and animal commodities as a basis for determining their economic feasibility.

3. *Engineering Design.* Equipment is designed for specialized uses and assembled for pilot-plant research in process development.

4. *Advice to Industry.* Information is obtained for advice to industry on the design of commercial units for processes developed by the Laboratory.

5. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

Principal Scientist:

DR. S. N. TIMASHEFF*

This Laboratory seeks an understanding, on the most fundamental level, of the structure of biological macromolecules and the relation of this structure to their activity or function. Investigations encompass such problems as determination of the gross and fine structure of proteins and nucleic acids in solution and in the solid state; effects of interactions between macromolecules, as well as between macromolecules and small molecules and solvent components, on the conformation and activity of the macromolecules; effects of mutations and the existence of polymorphism on the biophysical properties of the molecules; and development of new theories and experimental methods that will advance scientific knowledge of biological macromolecules and the nature of their functions.

*Brandeis University, Waltham, Mass.

DIRECTORY

HEADQUARTERS

Eastern Utilization Research
and Development Division

600 E. Mermaid Lane, Wyndmoor, Pa.
215 Chestnut Hill 7-5800

<u>Room</u>		<u>Phone Extension</u>
3032	Aceto, N. C.	247
3128	Chortyk, O. T.	283
2026	Connor, E. A.	240
3024	Cording, J., Jr.	280
2024	Corrigan, G. A.	241
3010	Dryden, E. C.	385
1122	Eddy, C. R.	345
2204	Filachione, E. M.	360
1004	Finn, D. K.	215
1026	Gaspari, D.	296
1112	Gordon, W. G.	333
3028	Heiland, W. K.	282
3116	Hills, C. H.	270
2015	Jasewicz, L. B.	230
2015	Krider, M. M.	210
2107	Maerker, G.	353
3122	Mellon, E. F.	363
2025	Moyer, D. B.	205
2000	Naghski, J.	227
1030	Nutting, G. C.	285
1128	Ogg, C. L.	343
3119	Porter, W. L.	322
2034	Ratchford, W. P.	243
2012	Roberts, N. E.	214
2118	Rothbart, H.	250
2106	Schepartz, A. I.	336
2110	Schmeltz, I.	350
2019	Scott, W. E.	212
2130	Silbert, L. S.	249
3015	Sills, M. W.	218
3026	Sinnamon, H. I.	281
3110	Stedman, R. L.	264
3104	Stirton, A. J.	256
1124	Susi, H.	340
1013	Swift, C. E.	225
3015	Treadway, R. H.	209
2105	Wasserman, A. E.	355
2032	Wells, P. A.	242
3000	White, J. W., Jr.	231
2100	Willits, C. O.	351
1205	Windus, W.	217
1032	Witnauer, L. P.	226
3004A	Woodward, C. F.	329
3006	Wrigley, A. N.	244
1100	Zittle, C. A.	332

DAIRY PRODUCTS LABORATORY

South Building, USDA
14th St. & Independence Ave., SW.
Washington, D. C. 20250
202 REpublic 7-4142

<u>Room</u>		<u>Phone Extension*</u>
0139	Coulson, E. J.	5289
0640	Edmondson, L. F.	5006
0612	Pallansch, M. J.	2484
1638	Parks, O. W.	4569
1655	Patterson, W. I.	2361
1642	Selman, R. L.	2419
1644	Webb, B. H.	2364

*To call directly, dial DUdley 8, then extension
(Area Code 202)

BELTSVILLE LABORATORIES

(Meat and Dairy Products)
Agricultural Research Center
Beltsville, Md. 20705
301 GRanite 4-4800

<u>Building No.</u>		<u>Phone Extension</u>
200	Alford, J. A.	394
200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394
157	Walter, H. E.	215

POTATO PRODUCTS INVESTIGATIONS

Red River Valley Potato Research Center
P. O. Box 113
East Grand Forks, Minn. 56721
218-773-2473
Shaw, R. L.

KENTUCKY COOPERATIVE TOBACCO INVESTIGATIONS

Room 213, Thomas Poe Cooper Building
University of Kentucky
Lexington, Ky. 40506
606-258-9000, Ext. 2628, 2671
Burdick, D.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

Graduate Department of Biochemistry
Brandeis University
Waltham, Mass. 02154
617-894-6000, Ext. 547
Timasheff, S. N.

HOW TO REACH THE EU LABORATORIES

Wyndmoor, Pa.

By air. The Philadelphia International Airport is about 18 mi. south of the Wyndmoor laboratories. Take taxi or airport limousine to one of the downtown railroad stations given below. To drive, turn right from airport parking lot on Essington Avenue and go 1 mi. to traffic circle. Bear right on Penrose Avenue, following sign to "Center City, Schuylkill Expressway." Continue for 2.3 mi. to 26th Street, then turn left. From here, go 8.7 mi., following Schuylkill Expressway (Interstate 76) to U. S. 1. Instructions for getting to the Laboratories from the expressway are given below.

By car. From the south, approach Philadelphia on U. S. 1 (City Line Avenue) or use Schuylkill Expressway. Leave expressway at City Line Avenue at exit marked "City Avenue Bridge, Germantown, Chestnut Hill." Cross bridge over the Schuylkill River and follow signs to Wissahickon Drive. Proceed on the drive (which becomes Lincoln Drive) for 4.8 mi. to Mt. Pleasant Avenue. Turn right and go 1.3 mi. to Stenton Avenue, then turn left and go 0.9 mi. to Mermaid Lane, then turn right. Laboratories are on the right side of Mermaid Lane, 0.2 mi from Stenton Avenue.



From the north, east, and west, the point most accessible by car to the Wyndmoor Laboratories is the Fort Washington Interchange of the Pennsylvania Turnpike. From here, follow U. S. 309 south for 2.4 mi. to Paper Mill Road exit. Turn right and go 0.3 mi. to Cheltenham Avenue, then left and go 1.2 mi. to Mermaid Lane, then turn right. Laboratories are on the left side of Mermaid Lane 0.9 mi. from Cheltenham Avenue.

By Pennsylvania Railroad. Take Chestnut Hill train from Philadelphia at Suburban Station, 16th Street and Kennedy Boulevard; at 30th Street Station; or at North Philadelphia Station. Laboratories are 1½ mi. from Chestnut Hill Station. Take a taxi or a southbound "L" bus marked "Broad-Olney Subway" to Stenton Avenue and Mermaid Lane and walk right 2 blocks to the Laboratories.

By Reading Railroad. Take Chestnut Hill train from Philadelphia at Reading Terminal, 12th and Market Streets; at North Broad Street Station; or at Wayne Junction. Get off at Wyndmoor. Laboratories are 5 blocks north of station on Mermaid Lane.

By local transportation. Take a Broad Street Subway train to Olney Avenue. Get transfer when paying fare. Transfer to "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. Get off bus at Mermaid Lane and Stenton Avenue, and walk right 2 blocks to the Laboratories.

Washington, D. C.

The Dairy Products Laboratory is located in the South Building of the U. S. Department of Agriculture at 14th Street and Independence Avenue, SW., near the Washington Monument.

Beltsville, Md.

The Meat Laboratory and the pilot plant of the Dairy Products Laboratory are located, respectively, in the Animal Husbandry Administration Building (Bldg. 200) and the Dairy Products Building (Bldg. 157) at the Agricultural Research Center, Beltsville, Maryland. The Center lies between U. S. 1 and the Baltimore-Washington Parkway, about 15 miles northeast of Washington, D. C. It is reached conveniently only by automobile, since it is about 2 miles from the Beltsville stop of the Greyhound and Trailways buses on U. S. 1.

East Grand Forks, Minn.

The Potato Products Investigations are carried on at the Red River Valley Potato Research Center, located on U. S. 202 and 9th Avenue, South, in East Grand Forks, Minnesota. This is just about a mile from the DeMer Bridge crossing the Red River from Grand Forks, North Dakota.

University of Kentucky

The Kentucky Cooperative Tobacco Investigations are carried out at the University of Kentucky, Lexington, Ky., in Room 213, Thomas Poe Cooper Bldg.

Brandeis University

The Pioneering Research Laboratory of Physical Biochemistry is located in the Graduate Department of Biochemistry at Brandeis University. The Brandeis campus is in Waltham, Massachusetts, about 10 miles west of Boston, 2 miles from Exit 51 on Route 128.

**Other Divisions of
NUTRITION, CONSUMER, AND
INDUSTRIAL USE RESEARCH**

**Agricultural Research Service
U. S. Department of Agriculture**

**Northern Utilization Research and Development
Division**

1815 N. University St.
Peoria, Ill. 61604
Phone 309-685-4011
Dr. R. J. Dimler, Director

Cereal grains: corn, wheat, barley, grain sorghum, and oats; oilseeds: soybean, flaxseed, and erucic acid-containing oilseeds; new crops.

**Southern Utilization Research and Development
Division**

1100 Robert E. Lee Blvd. (P.O. Box 19687)
New Orleans, La. 70119
Phone 504-282-1441
Dr. C. H. Fisher, Director

Cotton and cottonseed; tung fruit; pine gum; Southern fruits and vegetables, including citrus, sweetpotatoes, and cucumbers; sugarcane; rice; peanuts.

**Western Utilization Research and Development
Division**

800 Buchanan St.
Albany, Calif. 94710
Phone 415-525-2244
Dr. M. J. Copley, Director

Western fruits, nuts, vegetables, and rice; poultry products; forage crops; wheat; barley; wool and mohair; sugar beets; dry beans and peas; castor beans; safflower.

Consumer and Food Economics Research Division

Federal Center Bldg.
Hyattsville, Md. 20781
Phone 202 DUdley 8-8451
Dr. Faith Clark, Director

Levels of living as determined by surveys; nutritional appraisal of diets and food supplies; problems of household management.

Human Nutrition Research Division

Agricultural Research Center
Beltsville, Md. 20705
Phone 301 GRanite 4-4800, Ext. 337
Dr. Willis A. Gortner, Director

Metabolic processes and nutritional requirements of man; nutritive and other consumer values of food.

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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

NOV 1 1969

★**Wyndmoor, Pa.**

CURRENT SERIAL RECORDS

MAILING ADDRESS:

**600 E. Mermaid Lane
Philadelphia, Pa. 19118
215 Chestnut Hill 7-5800**

OTHER LABORATORIES AND FIELD STATIONS:

- ★ **Washington, D. C.**
- ★ **Beltsville, Md.**
- ★ **E. Grand Forks, Minn.**
- ★ **Lexington, Ky.**
- ★ **Waltham, Mass.**

**Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE**

U. S. Department of Agriculture Agricultural Research Service

Dr. G. W. Irving, Jr.
Administrator

Dr. F. R. Senti
Deputy Administrator
for Nutrition, Consumer, and
Industrial Use Research

EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

Dr. W. P. Ratchford
Acting Director

In 1938, Congress authorized the construction of four Regional Research Laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 Laboratories now known as the Eastern Utilization Research and Development Division.

Research is conducted in these Eastern Division laboratories on animal products: dairy, meats, fats, and leather; and plant products: Eastern fruits and vegetables, tobacco, and maple.

Most of the laboratories where this work is done are located in the headquarters building at Wyndmoor, Pa., often referred to by its original name, the Eastern Regional Research Laboratory. Exceptions are the Dairy Products Laboratory, located in the South Building, U. S. Department of Agriculture, Washington, D. C., and the Agricultural Research Center, Beltsville, Md.; the Meat Laboratory, at Beltsville and Wyndmoor; the Potato Products Investigations, in East Grand Forks, Minnesota; the Kentucky Cooperative Tobacco Investigations, at the University of Kentucky, Lexington; and the Pioneering Research Laboratory of Physical Biochemistry, at Brandeis University, Waltham, Massachusetts. For addresses, see page 25.

For the locations and fields of research of other Nutrition, Consumer, and Industrial Use Research see page 28.

March 1969

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OFFICE OF THE DIRECTOR

Dr. W. P. Ratchford
Acting Director
Assistant Director, Program Operations

Dr. W. I. Patterson
Assistant Director,
Program Development and Appraisal

Dr. R. H. Treadway
Assistant Director, Industrial Development

E. C. Dryden	T. S. Seibles, III
Dr. M. M. Krider	Dr. H. A. Walens
Assistants to Director	

W. E. Scott
Patents

M. W. Sills
Marketing Research

Mrs. D. K. Finn
Librarian

N. E. Roberts
Public Information Officer

ADMINISTRATIVE MANAGEMENT

E. A. Connor
Assistant to Director for Management

G. A. Corrigan
Personnel Officer

D. B. Moyer
Administrative Officer

PLANT MANAGEMENT

D. Gaspari
Mechanical Superintendent

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Acting Chief: DR. A. N. WRIGLEY

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: DR. A. N. WRIGLEY

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, and hydroxylation are evaluated as plasticizers and for use in the internal and external modification of polymers. Long-chain phosphorus and sulfur compounds synthesized from animal fats are also evaluated as plasticizers.

2. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Copolymerization mechanisms and parameters are studied and evaluated, and the physical-chemical characteristics of the copolymers are investigated.

3. *Structure of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers, and copolymers is studied.

Lubricants Investigations

Head: DR. G. MAERKER

1. *New Lubricant Components.* New fatty chemicals useful as lubricant components are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives. New products are evaluated as base oils, additives, grease thickeners, etc.

2. *Alkylene Oxides and Imines.* The reactions of fat-derived epoxides and aziridines are studied in detail and their mechanisms explored for the purpose of preparing suitable lubricant components. Reaction products are further modified in the light of test results.

Detergents Investigations

Head: DR. A. J. STIRTON

1. *Biodegradability.* Detergents and surface-active agents from animal fats are investigated for ease of biodegradation under both aerobic and anaerobic conditions.

2. *Synthesis and Evaluation.* New detergents and surface-active agents are synthesized from animal fats and evaluated for detergent, foaming, wetting, emulsifying, and other properties. Combinations with soap or other detergents or surface-active agents are investigated for household or industrial use.

Exploratory Reactions Investigations

Head: DR. L. S. SILBERT

1. *Activation Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats. Unusual rearrangements and reaction mechanisms are explored.

2. *Peroxides.* Peroxides are prepared from animal fats, and their chemical and physical properties and applications are investigated.

3. *New Chemical Intermediates.* Animal fats are further modified by the introduction of reactive ester, sulfur, and other functional groups in order to synthesize new chemical intermediates.

MEAT LABORATORY

*Chief: W. L. SULZBACHER**

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and developing better methods of handling, preserving, and processing meats. The investigations are carried out in the areas of composition and quality, flavor, microbiology, and product stability.

Composition and Quality Investigations

Head: C. E. SWIFT

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats so that the products obtained will have more tenderness and juiciness and better color, and so that meats from all commercial grades and cuts will be utilized to their optimum.

*Beltsville, Md.

Meat Flavor Investigations

Head: DR. A. E. WASSERMAN

1. *Flavor Precursors.* Meat flavor precursors and compounds are isolated and characterized, and then their modification by processing techniques is studied.

2. *Wood Smokes.* The wood smokes used in meat processing are studied to determine their chemical composition and the interaction of their components with meat constituents.

3. *Flavor Chemistry.* The chemical precursors of meat flavor are identified and their reactions to form flavorful compounds are investigated both chemically and organoleptically.

4. *Improvement in Meat Flavor.* Results of these flavor studies are applied to the production of new and improved meat products.

Microbiology Investigations

Head: DR. J. A. ALFORD*

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are developed.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures or during meat processing, and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

Product Stability Investigations

Head: A. M. GADDIS*

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

3. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

*Beltsville, Md.

4. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

HIDES AND LEATHER LABORATORY

Chief: **DR. J. NAGHSKI**

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation and leather manufacture.

Composition Investigations

Head: **DR. E. F. MELLON**

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: DR. E. M. FILACHIONE

1. *Protein Complex in Hides.* Basic principles related to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: DR. W. WINDUS

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers with new and extended industrial uses. Food uses are sought for collagen, the protein constituent of hide.

2. *Mineral Tannages.* Leather with improved resistance to deterioration is sought through the study of mineral tannages.

3. *Combination Tannages.* Leather with improved or special properties is sought through the application of combination and modified tannages and post-tanning treatments.

4. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of domestic tanning materials and leather tanned by these materials.

5. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to industry to permit the translation of laboratory discoveries to practical applications.

DAIRY PRODUCTS LABORATORY

Chief: **DR. B. H. WEBB***

The work of the Dairy Products Laboratory falls within six principal investigation areas. These are concerned with the study of dried milk products, fluid milk concentrates, cheese and butterfat, dairy processing equipment, milk flavor, and allergens in milk.

Dried Milk Products Investigations

Head: **DR. M. J. PALLANSCH***

1. *Chemistry.* The fundamental chemistry of dried milk products and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved dried milk products is undertaken.

3. *New Products and Uses.* New and improved products are developed and methods are explored for increasing the use of dried milk in bakery goods.

4. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting basic investigations of dried milk products are developed and improved.

Fluid and Concentrated Milk Investigations

Head: **DR. L. F. EDMONDSON***

1. *Chemistry.* The chemistry of fluid concentrated milks and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved sterile, sweetened-condensed, and frozen concentrated milks is undertaken.

3. *Product Improvement.* Ion-exchange and electrodialysis techniques are experimented with for improving fluid concentrated milk products.

4. *Evaluation.* Chemical and physical methods and instrumentation for conducting investigations of concentrated milks are developed and improved.

*Washington, D. C.

Cheese and Butterfat Investigations

*Head: DR. L. C. BLANKENSHIP**

In Charge of Pilot Plant Research:

H. E. WALTER†

1. *Chemistry.* The fundamental chemistry of cheese, butter, and butter oil, and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved cheeses, butter, butter oil, and related products is undertaken.

3. *Microbiology.* The microbiology of milk, cheese, butter, and cultured milk products is studied.

4. *Whey.* New or improved products from whey are sought by a study of the microbiology, chemistry, biochemistry, and technology of this dairy byproduct.

5. *Evaluation.* Microbiological and chemical methods and instrumentation for conducting investigations of cheese, butter, whey, and cultured milk products are developed and improved.

Dairy Processing Equipment Investigations

*Acting Head: DR. B. H. WEBB**

1. *Design Data.* Fundamental data are obtained as a basis for the design of more efficient equipment for the processing of dairy products.

2. *Specialized Equipment.* New and improved specialized equipment is developed and designed.

3. *Pilot-Plant Equipment.* Practical pilot-plant equipment is developed and designed.

4. *Commercial Processing.* Plans and cost estimates are developed for large-scale commercial processing.

Milk Flavor Investigations

*Acting Head: DR. B. H. WEBB**

1. *Flavor Constituents.* The individual constituents of milk flavor are isolated, purified, and identified.

2. *Flavor Formation.* The mechanism of flavor formation in dairy products is determined.

3. *Laboratory Studies.* Basic laboratory procedures are developed for removing undesirable flavors, preserving desirable flavors, and preventing the formation of off-flavors in milk and milk products.

4. *Taste Panels.* Statistically valid sensory tests are developed and correlated with objective tests used to measure changes in the flavor of milk and milk products.

5. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting investigations of milk flavor are developed and improved.

*Washington, D. C.

†Beltsville, Md.

Allergens Investigations

*Head: DR. E. J. COULSON**

1. *Incidence of Milk Allergy.* The incidence of allergy to the known proteins of milk is determined.

2. *Isolation and Purification of Milk Allergens.* Allergens from fluid milk are isolated and purified and their homogeneity established by physical, chemical and immunological characterization.

3. *Chemical Groups Responsible.* Specific chemical groups responsible for allergic and immunological reactions are determined.

4. *Deallergenization Methods.* Methods for deallergenizing milk are determined.

MILK PROPERTIES LABORATORY

Chief: DR. G. C. NUTTING

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of the work is directly related to the effects of processing on milk properties. Most of the research relates to the proteins and enzymes of milk.

Isolation and Purification Investigations

Head: DR. C. A. ZITTLE

1. *Separation Methods.* Means are sought to isolate, purify, and characterize the caseins and whey proteins, lipoproteins, and enzymes and other quantitatively minor "leakage" proteins originating in milk-secreting cells and in the blood-vascular system.

2. *Polymorphism.* Genetic and metabolic polymorphism of the principal milk proteins among breeds and bloodlines is investigated.

*Washington, D. C.

3. *Casein Complexes.* Compositional and structural relationships among casein micelles are sought. Association of ions ("milk salts") with the major protein species in molecular complexes, micelles, and larger aggregates is determined.

4. *Enzyme Effects.* Effects of "natural" proteolytic and other milk enzymes on the properties of milk and its components are studied.

5. *Fat Globule Membranes.* Milk fat globule membranes, both natural and artificial, are investigated to determine their chemical nature and the mechanism whereby emulsions of milk fat are stabilized.

6. *Processing Properties.* Changes in milk properties upon processing (heating, concentrating, drying, freezing) are correlated with the molecular and micellar makeup of the proteins.

Structure and Composition Investigations

Head: DR. W. G. GORDON

1. *Amino Acid Analyses.* Amino acid analyses are made on major and minor milk proteins, including enzymes; on chemically modified proteins; on proteoses and peptones of milk; and on peptides made by selective enzymatic degradation of proteins.

2. *Modification of Pure Proteins.* Selected pure milk proteins are subjected to controlled chemical modification to determine their topochemical behavior and effects on their molecular association in solution.

3. *Primary Structure.* Amino acid sequence is determined on peptides of unusual interest, such as "difference peptides" from genetic polymorphs of milk proteins; and at the ends of the peptide chain of undegraded protein molecules.

Physical-Chemical Investigations

Acting Head: DR. G. C. NUTTING

1. *Molecular Structure of Proteins.* Molecules and aggregates of the principal milk proteins and their genetic polymorphs are investigated to determine their secondary and tertiary structure, and this is correlated with their amino acid composition, peptide composition, and amino acid sequence.

2. *Molecular Behavior of Proteins.* Explanations of molecular behavior of milk proteins are sought in terms of their bond types, energy and entropy effects, and local geometry.

3. *Protein Interaction.* The interaction of selected milk proteins with ions and small molecules is studied.

PLANT PRODUCTS LABORATORY

Chief: DR. J. W. WHITE, JR.

The Plant Products Laboratory undertakes investigations on Eastern fruits and vegetables including potatoes, and maple sap and sirup, and also does analytical chemical research on these products as well as on the composition of other agricultural commodities assigned to the Eastern Division. There are five areas of investigation: fruits, potatoes and other vegetables, potato products, maple, and special plants.

Fruit Investigations

Head: DR. C. H. HILLS

1. *Study of Components.* The organic constituents of deciduous fruits are isolated and identified. Components that affect the color, flavor, aroma, and texture of processed fruit products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of fruits and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Processing Quality.* The influence of variety, cultural practices, mechanical harvesting, and pre-processing treatments on the quality of processed fruit products is studied.*

4. *New Products and Processes.* An extended use of Eastern deciduous fruits is sought through the development of new food products and processes.

*In cooperation with the Crops Research Division, ARS, and with State Experiment Stations.

5. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Potato and Other Vegetable Investigations

Head: DR. W. L. PORTER

1. *Study of Components.* The individual components of potatoes and other vegetables are isolated and identified. Those components that produce and control the color, flavor, texture, and storage properties of processed products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of potatoes and other vegetables and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Varieties and Cultural and Storage Practices.* The influence of varieties and cultural and storage practices on the quality of potato and other vegetable products is studied.*

4. *Potato-Processing Wastes.* The feasibility of extracting useful substances from potato-processing wastes is studied as a means of reducing environmental pollution.

5. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Maple Investigations

Acting Head: DR. J. W. WHITE, JR.

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

*In cooperation with the Crops Research and Market Quality Research Divisions, ARS.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Processes and Products from Maple.* Improved and extended industrial uses of maple sirup are sought by developing new processes and products.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation for the conduct of these investigations are developed and improved.

Potato Products Investigations*

Head: R. L. SHAW, JR.

1. *Varieties and Cultural Practices.* The influence of varieties and cultural factors on the quality of commercial forms of processed potatoes is studied.†

2. *Storage.* The influence of storage environment on the quality of commercial forms of processed potatoes is studied.‡

3. *Composition of New Varieties.* The gross composition of new and experimental potato varieties is related to established processing methods and quality of products.†

4. *Processing Potential of New Varieties.* Laboratory methods are devised and developed to screen new and experimental varieties of potatoes for their processing potential.†

5. *Pilot-Plant Operations.* Integrated pilot plants are planned and operated to accurately foretell the effects of the cultural and varietal factors on a commercial scale.

6. *Product Evaluation.* Products are evaluated by appropriate subjective and objective methods.

Special Plant Investigations

Head: DR. C. L. OGG

1. *Evaluation Methods.* Chemical and physical methods for the evaluation of commodities under investigation in various Laboratories of the Division are developed and improved.

2. *Electronic Instrumentation.* Electronic instrumentation is developed for the conduct of research by the various investigations in the Division.

3. *Flavor Research.* Flavors and flavor precursors in plant products are identified.

4. *Special Analytical Techniques.* Microanalytical, mass spectrometric, and gas chromatographic techniques are applied to products of all Laboratories of the Division.

*East Grand Forks, Minnesota. Operated in cooperation with the Minnesota and North Dakota Agricultural Experiment Stations and the Red River Valley Potato Growers Association.

†In cooperation with the Crops Research Division, ARS.

‡In cooperation with the Market Quality Research Division, ARS.

5. *Collaborative Studies.* Chemical and physical methods are evaluated in collaboration with outside laboratories.

TOBACCO LABORATORY

Chief: DR. C. F. WOODWARD

The Tobacco Laboratory does research on leaf and smoke constituents and on tobacco products aimed at improving their quality and minimizing or eliminating any harmful biological effects that may be associated with smoking. Investigations are conducted on cigar and cigarette smoke, tobacco leaf, leaf processing, and pyrolysis, and special cooperative research is carried on at the University of Kentucky on health-related aspects of smoking.

Smoke Investigations

Head: DR. R. L. STEDMAN

1. *Smoke Quality.* The constituents of smoke that contribute to flavor, aroma, and biological activity are isolated and identified.

2. *Analytical Methods.* Improved methods are developed to isolate and determine components of major organoleptic and biological importance.

3. *Smoke Fractionation.* Constituents and fractions of smoke are prepared for biological evaluation.

4. *Correlation of Smoke Components and Quality.* The composition of smoke is correlated with its flavor, aroma, and physiological characteristics.

Leaf Investigations

Head: DR. O. T. CHORTYK

1. *Leaf Quality.* The leaf constituents responsible for the flavor, aroma, and biological activity of smoke are isolated and identified.

2. *Leaf Composition and Quality.* The relationships between leaf composition and the flavor, aroma, and biological characteristics of smoke are evaluated.

3. *Variations in Tobacco Types.* Differences in constituents of various tobacco types are determined.

4. *Biological Preparations.* Leaf compounds and fractions are prepared for biological tests.

Leaf Processing Investigations

Head: DR. A. I. SCHEPARTZ

1. *Tobacco Fermentation.* The microflora involved in tobacco fermentation are isolated and identified.

2. *Enzymes.* The enzymes elaborated by the principal microflora are determined.

3. *Processing Methods.* Improved methods for processing tobacco leaf are developed.

4. *Processing Treatment and Quality.* The flavor, aroma, and physiological characteristics of tobaccos from various processing treatments are correlated.

Pyrolysis Investigations

Head: DR. I. SCHMELTZ

1. *Pyrolytic Products.* Pyrolytic products of tobacco leaf constituents are determined.

2. *Burn-Temperature Modification.* Tobacco additives are sought that will change the burn temperature.

3. *Smoke Formation.* The basic physico-chemistry of the smoke-forming process is investigated.

4. *Removal of Smoke Constituents.* Techniques are developed to selectively remove smoke constituents.

Kentucky Cooperative Tobacco Investigations*

Head: DR. D. BURDICK

1. *Modification of Products.* Smoking products are developed with physical and chemical properties altered by the use of chemical modifiers and tobaccos of different cultural histories.

2. *Analytical Methods.* New and improved analytical methods are developed for the detection and determination of tobacco leaf and smoke constituents of physiological importance.

3. *Bio-Assays.* Tobacco leaf and smoke constituents are bio-assayed, and more efficient bio-assay procedures are developed for this work.

*Lexington, Kentucky

PHYSICAL CHEMISTRY LABORATORY

Chief: DR. L. P. WITNAUER

The Physical Chemistry Laboratory is concerned with the determination of molecular structures, the development and application of mathematical procedures, the measurement of physical properties, and the investigation of the principles and techniques of separation science. The basic studies are applied to the constituents of and products from hides, fats, milk, meat, and other commodities assigned to the Division.

Molecular Structure Investigations

Head: DR. H. SUSI

1. *Physical Techniques.* Absorption spectroscopy, X-ray diffraction, NMR spectroscopy, and other physical techniques are applied to develop information concerning the inter- and intramolecular structure of the constituents of hides, fats, meat, milk, and other products, and of pertinent model systems.

2. *Experimental and Mathematical Techniques.* Specialized experimental and mathematical techniques are developed and applied for structural studies, such as investigations on isotopically substituted molecules, precise measurements in aqueous solutions, investigations with polarized radiation, and adaptation of recent theoretical advances for solving specific problems.

3. *Relationship Between Structure and Properties.* Inter- and intramolecular parameters, such as hydrogen-bond energies, rotational barriers, molecular force constants, and the form of normal vibrations, as revealed through experimental studies in conjunction with pertinent calculations, are related to the chemical and physical characteristics of the products under investigation.

4. *Collaborative Studies.* Consultations and collaborative studies are carried out involving molecular spectroscopy and molecular structure.

Mathematical Investigations

Head: DR. C. R. EDDY

1. *Calculation of Molecular Data.* Mathematical methods and computer-based procedures are developed for obtaining basic molecular information from experimental measurements to assist research on milk, meat, animal fats, potatoes, tobacco, and hides.

2. *Calculation of Material Properties.* Computer-based procedures are developed for obtaining information on properties of materials above the molecular level from experimental measurements such as dielectric properties, dynamic mechanical behavior, and X-ray diffraction for use in research on animal fats, milk constituents, and hides.

3. *Theoretical Computation of Molecular Properties.* Internal molecular properties not readily accessible to experimental measurements are computed theoretically for application to constituents of, and products from, animal fats, hides, milk, meat, and maple sap.

4. *Consultations and Service.* Mathematical consultations and general computer services are provided.

Physical Properties Investigations

Acting Head: DR. L. P. WITNAUER

1. *Application of Existing Techniques.* Light scattering, osmotic pressure, ultracentrifugation, electron microscopy, electrophoresis, differential thermal analysis, rheometry, and mechanical, electrical, and other techniques are applied to determine the physical properties of, constituents of, and products from, such commodities as hides, animal fats, milk, and meat.

2. *New Techniques.* Such new techniques and apparatus as electrical birefringence and light scattering in an electric field are developed as needed for basic physical characterization of the constituents of various products.

3. *Evaluation Studies.* Components and derivatives of such products as hides and fats are evaluated through examination of their mechanical and thermal properties and other characteristics important to their potential usefulness as films, fibers, thickeners, and surface-active agents.

4. *Collaborative Studies.* Consultation and collaborative studies are carried out involving physical properties.

Separations and Composition Investigations

Head: DR. H. L. ROTHBART

1. *Separation Techniques.* Chromatography, counter-current distribution, zone refining, and other separation techniques are studied to develop information about the composition of such products as animal fats, meat, milk, and tobacco.

2. *Principles of Separation Processes.* The basic principles underlying separation processes, including equilibrium and transport phenomena, are determined in order to develop the mathematical representations required to predict efficient separations of components of various products.

3. *New and Improved Separation Procedures.* New and improved methods and instrumentation are developed for the separation of components of various products.

4. *Stability Investigations.* The factors that affect the stability of animal fats and other food products are determined.

5. *Collaborative Studies.* Consultations and collaborative studies are carried out with other research units on problems in separation science.

ENGINEERING AND DEVELOPMENT LABORATORY

Chief:

N. C. ACETO

The Engineering and Development Laboratory, which originates, evaluates, and develops new processes on a pilot-plant scale, is working in four investigation areas. Two of these are concerned with the development of new and improved products from animals and plants. In the third investigation area, cost and design information is developed, and in the fourth, unit operations are conducted to obtain fundamental engineering data as a basis for the development of new processes and the improvement of existing ones.

Animal Products Engineering Investigations

Acting Head: N. C. ACETO

1. *New and Improved Products.* New and improved products from animals are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on commercialization of developments.

Plant Products Engineering Investigations

Head: J. CORDING, JR.

1. *New and Improved Products.* New and improved products from plants are being originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and equipment best suited to the requirements of the products are being determined, and new equipment is being devised where necessary.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering data for estimation of commercial costs.

4. *Advice to Industry.* Plans are developed for semi-works and larger-scale processing as a basis for advising industry on commercialization of developments.

Unit Operations Engineering Investigations

Head: H. I. SINNAMON

1. *New Processes and Products.* A basis for the discovery or development of new processes and products from animal and plant commodities is provided by a fundamental study of unit operations.

2. *Equipment Design.* Fundamental data are obtained to permit the design of more efficient processing equipment.

3. *Relation to Practical Operation.* Fundamental findings are related to practical pilot-plant operation.

Cost and Design Engineering Investigations

Head: W. K. HEILAND

1. *Preliminary Cost Estimates.* To help determine the advisability of pilot-plant operation of a proposed process, preliminary cost estimates are prepared.

2. *Economic Feasibility of New Processes and Products.* Comprehensive cost estimates are made for the commercial production and distribution of new products made from plant and animal commodities as a basis for determining their economic feasibility.

3. *Engineering Design.* Equipment is designed for specialized uses and assembled for pilot-plant research in process development.

4. *Advice to Industry.* Information is obtained for advice to industry on the design of commercial units for processes developed by the Laboratory.

5. *Specifications.* Detailed engineering specifications are prepared for the purchase of complex pilot-plant equipment.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

Principal Scientist:

DR. S. N. TIMASHEFF*

This Laboratory seeks an understanding, on the most fundamental level, of the structure of biological macromolecules and the relation of this structure to their activity or function. Investigations encompass such problems as determination of the gross and fine structure of proteins and nucleic acids in solution and in the solid state; effects of interactions between macromolecules, as well as between macromolecules and small molecules and solvent components, on the conformation and activity of the macromolecules; effects of mutations and the existence of polymorphism on the biophysical properties of the molecules; and development of new theories and experimental methods that will advance scientific knowledge of biological macromolecules and the nature of their functions.

*Brandeis University, Waltham, Mass.

DIRECTORY

HEADQUARTERS

Eastern Utilization Research
and Development Division

600 E. Mermaid Lane, Wyndmoor, Pa.
215 CHestnut Hill 7-5800

<u>Room</u>		<u>Phone Extension</u>
3032	Aceto, N. C.	247
3128	Chortyk, O. T.	283
2026	Connor, E. A.	240
3024	Cording, J., Jr.	280
2024	Corrigan, G. A.	241
3010	Dryden, E. C.	385
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2204	Filachione, E. M.	360
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1124	Susi, H.	340
1013	Swift, C. E.	225
3015	Treadway, R. H.	209
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3000	White, J. W., Jr.	231
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1100	Zittle, C. A.	332

DAIRY PRODUCTS LABORATORY

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14th St. & Independence Ave., SW.
Washington, D. C. 20250
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0139	Coulson, E. J.	5289
0640	Edmondson, L. F.	5006
0612	Pallansch, M. J.	2484
1655	Webb, B. H.	2364

*To call directly, dial DUDley 8, then extension
(Area Code 202)

BELTSVILLE LABORATORIES

(Meat and Dairy Products)
Agricultural Research Center
Beltsville, Md. 20705
301 GRanite 4-4800

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200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394
157	Walter, H. E.	215

POTATO PRODUCTS INVESTIGATIONS

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Shaw, R. L.

KENTUCKY COOPERATIVE TOBACCO INVESTIGATIONS

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Burdick, D.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

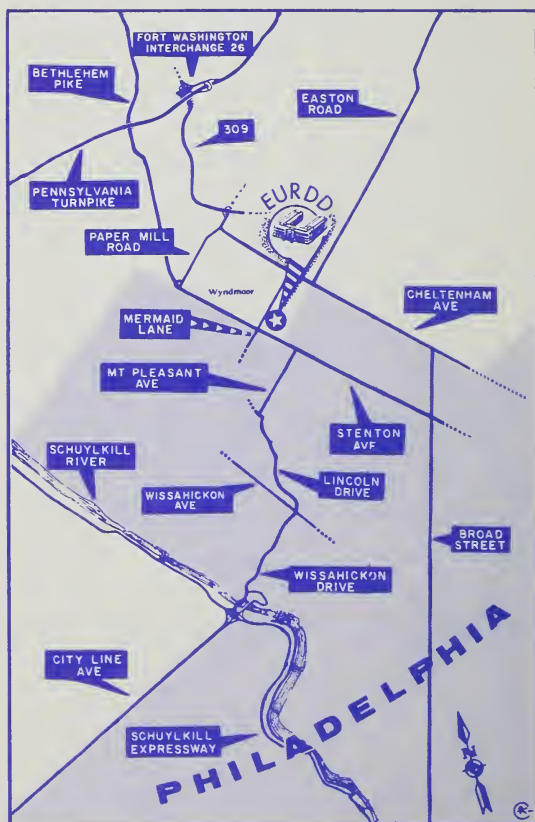
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Timasheff, S. N.

HOW TO REACH THE EU LABORATORIES

Wyndmoor, Pa.

By air. The Philadelphia International Airport is about 18 mi. south of the Wyndmoor laboratories. Take taxi or airport limousine to one of the downtown railroad stations given below. To drive, turn right from airport parking lot on Essington Avenue and go 1 mi. to traffic circle. Bear right on Penrose Avenue, following sign to "Center City, Schuylkill Expressway." Continue for 2.3 mi. to 26th Street, then turn left. From here, go 8.7 mi., following Schuylkill Expressway (Interstate 76) to U. S. 1. Instructions for getting to the Laboratories from the expressway are given below.

By car. From the south, approach Philadelphia on U. S. 1 (City Line Avenue) or use Schuylkill Expressway. Leave expressway at City Line Avenue at exit marked "City Avenue Bridge, Germantown, Chestnut Hill." Cross bridge over the Schuylkill River and follow signs to Wissahickon Drive. Proceed on the drive (which becomes Lincoln Drive) for 4.8 mi. to Mt. Pleasant Avenue. Turn right and go 1.3 mi. to Stenton Avenue, then turn left and go 0.9 mi. to Mermaid Lane, then turn right. Laboratories are on the right side of Mermaid Lane, 0.2 mi from Stenton Avenue.



From the north, east, and west, the point most accessible by car to the Wyndmoor Laboratories is the Fort Washington Interchange of the Pennsylvania Turnpike. From here, follow Pa. 309 south for 2.4 mi. to Paper Mill Road exit. Turn right and go 0.3 mi. to Cheltenham Avenue, then left and go 1.2 mi. to Mermaid Lane, then turn right. Laboratories are on left side of Mermaid Lane 0.9 mi. from Cheltenham Avenue.

By Penn Central Railroad. Take Chestnut Hill train from Philadelphia at Penn Center, 16th Street and Kennedy Boulevard; at 30th Street Station; or at North Philadelphia Station. Laboratories are 1½ mi. from Chestnut Hill Station. Take a taxi or a south-bound "L" bus marked "Broad-Olney Subway" to Stenton Avenue and Mermaid Lane and walk left 2 block to the Laboratories.

By Reading Railroad. Take Chestnut Hill train from Philadelphia at Reading Terminal, 12th and Market Streets; at North Broad Street Station; or at Wayne Junction. Get off at Wyndmoor. Laboratories are 5 blocks north of station on Mermaid Lane.

By local transportation. Take a Broad Street Subway train to Olney Avenue. Get transfer when paying fare. Transfer to "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. Get off bus at Mermaid Lane and Stenton Avenue, and walk right 2 blocks to the Laboratories.

Washington, D. C.

The Dairy Products Laboratory is located in the South Building of the U. S. Department of Agriculture at 14th Street and Independence Avenue, SW., near the Washington Monument.

Beltsville, Md.

The Meat Laboratory and the pilot plant of the Dairy Products Laboratory are located, respectively, in the Animal Husbandry Administration Building (Bldg. 200) and the Dairy Products Building (Bldg. 157) at the Agricultural Research Center, Beltsville, Maryland. The Center lies between U. S. 1 and the Baltimore-Washington Parkway, about 15 miles northeast of Washington, D. C. It is reached conveniently only by automobile, since it is about 2 miles from the Beltsville stop of the Greyhound and Trailways buses on U. S. 1.

East Grand Forks, Minn.

The Potato Products Investigations are carried on at the Red River Valley Potato Research Center, located on U. S. 202 and 9th Avenue, South, in East Grand Forks, Minnesota. This is just about a mile from the DeMer Bridge crossing the Red River from Grand Forks, North Dakota.

University of Kentucky

The Kentucky Cooperative Tobacco Investigations are carried out at the University of Kentucky, Lexington, Ky., in Room 213, Thomas Poe Cooper Bldg.

Brandeis University

The Pioneering Research Laboratory of Physical Biochemistry is located in the Graduate Department of Biochemistry at Brandeis University. The Brandeis campus is in Waltham, Massachusetts, about 10 miles west of Boston, 2 miles from Exit 51 on Route 128.

Other Divisions of

**NUTRITION, CONSUMER, AND
INDUSTRIAL USE RESEARCH**

**Agricultural Research Service
U. S. Department of Agriculture**

**Northern Utilization Research and Development
Division**

1815 N. University St.
Peoria, Ill. 61604
Phone 309-685-4011
Dr. R. J. Dimler, Director

Cereal grains: corn, wheat, barley, grain sorghum, and oats; oilseeds: soybean, flaxseed, and erucic acid-containing oilseeds; new crops.

**Southern Utilization Research and Development
Division**

1100 Robert E. Lee Blvd. (P.O. Box 19687)
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Phone 504-527-7544
Dr. C. H. Fisher, Director

Cotton and cottonseed; pine gum; Southern fruits and vegetables, including citrus, sweet potatoes, and cucumbers; rice; peanuts.

**Western Utilization Research and Development
Division**

800 Buchanan St.
Albany, Calif. 94710
Phone 415-525-2244
Dr. F. Stitt, Acting Director

Western fruits (including citrus, other subtropical, and tropical fruits); tree nuts; vegetables; poultry products; forage crops; wheat; rice; barley; wool and mohair; dry beans and peas; castor, safflower, and western oilseeds.

Southeastern Agricultural Research Laboratory

950 College Station Road
Athens, Ga. 30601
(Temporary address: Box 5677,
Athens, Ga. 30604)
Phone 404-548-5641, Ext. 324, -5, -6, -7
Dr. C. H. Harry Neufeld, Director

Southeastern fruits, vegetables, forages, and oilseeds; poultry, pork, pecans, sunflower, citrus, and feed products.

Consumer and Food Economics Research Division

Federal Center Bldg.
Hyattsville, Md. 20782
Phone 202 DUDley 8-8451
Dr. Faith Clark, Director

Food consumption and use of family resources; nutritional appraisal of foods and diets; guidelines for food selection; economic problems of families.

Human Nutrition Research Division

Agricultural Research Center
Beltsville, Md. 20705
Phone 301 GRANite 4-4800, Ext. 337
Dr. Willis A. Gortner, Director

Metabolic effects of diet and nutritional requirements of man; nutritive values and consumer use of food.

NOTES

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LABORATORIES and FUNCTIONS of the

Eastern Utilization Research & Development Division

★ **Wyndmoor, Pa.**

MAILING ADDRESS:

600 E. Mermaid Lane
Philadelphia, Pa. 19118
Telephone: 215-247-5800

OTHER LABORATORIES AND FIELD STATIONS:

- ★ **Washington, D. C.**
- ★ **Beltsville, Md.**
- ★ **E. Grand Forks, Minn.**
- ★ **Waltham, Mass.**

**Agricultural Research Service
U. S. DEPARTMENT OF AGRICULTURE**

U. S. Department of Agriculture Agricultural Research Service

Dr. G. W. Irving, Jr.

Administrator

Dr. F. R. Senti

Deputy Administrator for
Marketing and Nutrition Research

EASTERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

Dr. I. A. Wolff

Director

In 1938, Congress authorized the construction of four Regional Research Laboratories around the country for the conduct of basic and applied research to find new and wider uses for American farm commodities. From the Eastern Laboratory has evolved a complex of 10 Laboratories now known as the Eastern Utilization Research and Development Division.

Research is conducted in these Eastern Division laboratories on animal products: dairy, meats, fats, and leather; and plant products: Eastern fruits and vegetables, tobacco, and maple.

Most of the laboratories where this work is done are located in the headquarters building at Wyndmoor, Pa., often referred to by its original name, the Eastern Regional Research Laboratory. Exceptions are the Dairy Products Laboratory, located in the South Building, U. S. Department of Agriculture, Washington, D. C., and the Agricultural Research Center, Beltsville, Md.; the Meat Laboratory, at Beltsville and Wyndmoor; the Potato Products Investigations, in East Grand Forks, Minnesota; and the Pioneering Research Laboratory of Physical Biochemistry, at Brandeis University, Waltham, Massachusetts. For addresses, see page 22.

For the locations and fields of research of other Marketing and Nutrition Research see page 25.

May 1970

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OFFICE OF THE DIRECTOR

Director
Dr. I. A. Wolff

Assistant Directors
Program Operations: **Dr. W. P. Ratchford**
Program Development and Appraisal:
(Vacancy)
Industrial Development: **Dr. R. H. Treadway**

Assistants to the Director
Dr. M. M. Krider **T. S. Seibles, III**
E. C. Dryden **Dr. H. A. Walens**

Patents
W. E. Scott

Marketing Research
M. W. Sills

Librarian
Mrs. C. H. Rosenberg (Acting)

Public Information Officer
N. E. Roberts

ADMINISTRATIVE MANAGEMENT

Assistant to Director for Management
E. A. Connor

Personnel Officer
G. A. Corrigan

Administrative Officer
D. B. Moyer

PLANT MANAGEMENT

Mechanical Superintendent
D. Gaspari

LABORATORIES

ANIMAL FAT PRODUCTS LABORATORY

Acting Chief: DR. G. MAERKER

The Animal Fat Products Laboratory is divided into four investigations groups. Three of these are concerned with the development of specific products from animal fats in the fields of plastics, lubricants, and detergents; and the fourth is conducting exploratory research on the reactions of these fats and their fatty acids and other derivatives.

Plastics Investigations

Head: DR. A. N. WRIGLEY

1. *Plasticizers from Animal Fat Derivatives.* Animal fat derivatives made by epoxidation, carboxylation, hydroxylation, and oligomerization are evaluated as plasticizers and as internal and external modifiers for polymers.

2. *Polymerization of Animal Fats.* Monomers, polymers, and copolymers are prepared from animal fats. Copolymerization mechanisms and parameters are studied and evaluated, and the physical-chemical characteristics of the copolymers are investigated.

3. *Structure of Polymers.* The relation of structure to the physical properties of long-chain compounds, polymers and copolymers is studied.

Lubricants Investigations

Head: DR. G. MAERKER

1. *New Lubricant Components.* New fatty chemicals useful as lubricant components are sought by applying novel, as well as known, reactions to animal fats, their component fatty acids, and their derivatives. New products are evaluated as base oils, additives, and grease thickeners.

2. *Alkylene Oxides and Imines.* The reactions of fat-derived epoxides and aziridines are studied in detail and their mechanisms explored for the purpose of preparing suitable lubricant components. Reaction products are further modified in the light of test results.

Detergents Investigations

Head: DR. A. J. STIRTON

1. *Biodegradability.* Detergents and surface-active agents from animal fats are synthesized and investigated for ease of biodegradation under both aerobic and anaerobic conditions.

2. *Formulation.* New detergent formulations based on animal fat products are devised and investigated, with emphasis on maximizing their effectiveness and minimizing their contribution to problems of pollution and eutrophication of lakes, rivers, and streams.

3. *Evaluation.* New detergents and surface-active agents from animal fats are evaluated for detergent, foaming, wetting, emulsifying, and other properties needed for household and industrial use. Soap-detergent combinations are investigated.

Exploratory Reactions Investigations

Head: DR. L. S. SILBERT

1. *Regiospecific Reactions.* Reactions are investigated which are designed to make use of the unactivated centers in saturated and unsaturated fatty acids and other derivatives from animal fats. Unusual rearrangements and reaction mechanisms are explored.

2. *Peroxides.* Peroxides are prepared from animal fats, and their chemical and physical properties and applications are investigated.

3. *New Chemical Intermediates and Applications.* Animal fats are further modified by the introduction of reactive ester, sulfur, and other functional groups in order to synthesize new chemical intermediates. These compounds are investigated for their potential commercial and consumer utility.

MEAT LABORATORY

*Chief: W. L. SULZBACHER**

The Meat Laboratory conducts research aimed at improving the quality of meat and meat products and developing better methods of handling, preserving, and processing meats. The investigations are carried out in the areas of composition and quality, flavor, microbiology, and product stability.

Composition and Quality Investigations

Head: C. E. SWIFT

1. *Meat Proteins.* The bio- and physico-chemical characteristics of meat proteins and their interactions with the nonprotein components of meat, such as fat and minerals, are studied.

2. *Composition and Structure Related to Quality.* The protein and other chemical components of meat are related to its structure and to qualities such as tenderness and juiciness, which may be dependent on structure.

3. *Improvement in Meats and Meat Products.* Basic knowledge of meat composition and structure is applied to improve methods of handling, processing, and storing meats so that the products obtained will have more tenderness and juiciness and better color, and so that meats from all commercial grades and cuts will be utilized to their optimum.

*Beltsville, Md.

Meat Flavor Investigations

Head: DR. A. E. WASSERMAN

1. *Flavor Precursors.* Meat flavor precursors and compounds are isolated and characterized, and then their modification by processing techniques is studied.

2. *Wood Smokes.* The wood smokes used in meat processing are studied to determine their chemical composition and the interaction of their components with meat constituents.

3. *Flavor Chemistry.* The chemical precursors of meat flavor are identified and their reactions to form flavorful compounds are investigated both chemically and organoleptically.

4. *Improvement in Meat Flavor.* Results of these flavor studies are applied to the production of new and improved meat products.

Microbiology Investigations

Acting Head: W. L. SULZBACHER*

1. *Microbial Flora.* The microbial flora of meat and meat products is studied. This includes work on both beneficial and undesirable microorganisms and aspects of meat safety.

2. *Improved Preservation of Meat.* New and improved methods of preservation, involving such measures as pasteurization and irradiation or the use of antibiotics or other antimicrobial agents, are developed.

3. *Biochemical Effects of Microorganisms.* The fats and proteins of meat are studied to determine how they are affected biochemically by microorganisms growing at low temperatures or during meat processing, and the knowledge obtained is applied in an effort to develop better products.

4. *Microorganisms and Meat Quality.* Relationships between flavor, keeping quality, and processing methods and the microorganisms associated with meat products are studied in order to develop new and improved products and processing methods.

Product Stability Investigations

Head: A. M. GADDIS*

1. *Processed and Freezer-Stored Meats.* Interrelationships between the biochemical and organoleptic changes involved in the processing and freezer-storage of meat and meat products are studied.

2. *Rancidity.* The chemical nature of rancidity is under study and means of retarding its development are being investigated.

3. *Enzymes and Meat Stability.* The role of native and other enzymes in the stability of meat and meat products is studied.

4. *Improved Processing Methods.* The knowledge obtained through this basic research is applied in the development of new and improved meat processing methods.

*Beltsville, Md.

HIDES AND LEATHER LABORATORY

Chief: **DR. J. NAGHSKI**

The Hides and Leather Laboratory does fundamental and applied research to develop better, more versatile, and more economical leathers. Its work is carried out in three areas of investigation, one dealing with the composition of hides and skins, the second with improvement of these materials by chemical modification, and the third with the various processes of hide preservation, leather manufacture, and collagen conversion.

Composition Investigations

Head: **DR. E. F. MELLON**

1. *Properties of Hides and Skins.* A study is made of the composition, structure, and chemical and physical properties of animal hides and skins, their components and derivatives.

2. *Raw-Materials Composition and Finished-Materials Properties.* Relationships are established between the composition and structure of hides and skins and the properties of leathers, gelatins, and glues.

3. *Effects of Processing.* Selected processing operations are studied to determine their effects on the properties of hides and the products made from them.

4. *Analysis of Hide Components.* The proteins, mucoids, and lipoprotein complexes of hide are separated chemically and physically, purified and identified.

5. *Test Methods and Instrumentation.* Physical and chemical methods and instrumentation are developed for determining composition, chemical structure, and physical properties of hide substances.

Chemical Modification Investigations

Head: **DR. E. M. FILACHIONE**

1. *Protein Complex in Hides.* Basic principles related to the chemical modification of the protein complex as it occurs in animal hides or derived proteinaceous products are developed.

2. *Chemical Reactivity of Hides.* The interaction between animal hides and various organic reagents and chemicals is studied.

3. *Evaluation of New Hide Derivatives.* The fundamental physical and chemical properties of new derivatives are evaluated, and the scientific results are correlated for potential use in the discovery of new applications for animal hides and the creation of hide materials with unique properties.

4. *Improved Leathers.* A more profitable utilization of animal hides is sought through the development of new or improved types of leather and other products.

Processing Investigations

Head: DR. W. WINDUS

1. *New Uses Through New Processes.* New and improved methods for curing, preserving, unhairing, and tanning of hides are sought through the acquisition and evaluation of basic processing information, leading to the production of leathers with new and extended industrial uses. Food uses are sought for collagen, the protein constituent of hide.

2. *Hide Defects.* Defects in hides and skins are investigated to determine their cause and to characterize the nature of the attendant structural changes in order to develop procedures for detection, prevention, or eradication. Means are sought to improve the quality of rawstock so as to enhance the competitive position of leather.

3. *Tannages.* Leather with improved or special properties is sought through the application of mineral, vegetable, or synthetic tannages, individually or in combination.

4. *Test Methods.* Chemical and physical methods are developed for testing and evaluating the properties of hides, skins, and leather.

5. *Translation of Laboratory Results to Industrial Use.* Laboratory studies on the development of improved processes for hide conversion are correlated, so that counsel and advice can be provided to industry to permit the translation of laboratory discoveries to practical applications.

DAIRY PRODUCTS LABORATORY

*Chief: DR. B. H. WEBB**

The work of the Dairy Products Laboratory falls within six principal investigation areas. These are concerned with the study of dried milk products, fluid milk concentrates, cheese and butterfat, dairy processing equipment, milk flavor, and allergens in milk.

Dried Milk Products Investigations

*Head: DR. M. J. PALLANSCH**

1. *Chemistry.* The fundamental chemistry of dried milk products and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved dried milk products is undertaken.

3. *New Products and Uses.* New and improved products are developed and methods are explored for increasing the use of dried milk in bakery goods.

4. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting basic investigations of dried milk products are developed and improved.

*Washington, D.C.

Fluid and Concentrated Milk Investigations

*Head: DR. L. F. EDMONDSON**

1. *Chemistry.* The chemistry of fluid concentrated milks and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved sterile, sweetened-condensed, and frozen concentrated milks is undertaken.

3. *Product Improvement.* Ion-exchange and electrodialysis techniques are experimented with for improving fluid concentrated milk products.

4. *Evaluation.* Chemical and physical methods and instrumentation for conducting investigations of concentrated milks are developed and improved.

Cheese and Butterfat Investigations

Head: Dr. J. A. ALFORD†

1. *Chemistry.* The fundamental chemistry of cheese, butter and butter oil, and of processes for their manufacture is studied with a view to improving them or developing new ones.

2. *Technology.* Pilot-plant processing of new or improved cheeses, butter, butter oil, and related products is undertaken.

3. *Microbiology.* The microbiology of milk, cheese, butter, and cultured milk products is studied.

4. *Whey.* New or improved products from whey are sought by a study of the microbiology, chemistry, biochemistry, and technology of this dairy byproduct.

5. *Evaluation.* Microbiological and chemical methods and instrumentation for conducting investigations of cheese, butter, whey, and cultured milk products are developed and improved.

Dairy Processing Equipment Investigations

*Acting Head: DR. B. H. WEBB**

1. *Design Data.* Fundamental data are obtained as a basis for the design of more efficient equipment for the processing of dairy products.

2. *Specialized Equipment.* New and improved specialized equipment is developed and designed.

3. *Pilot-Plant Equipment.* Practical pilot-plant equipment is developed and designed.

4. *Commercial Processing.* Plans and cost estimates are developed for large-scale commercial processing.

Milk Flavor Investigations

*Acting Head: DR. B. H. WEBB**

1. *Flavor Constituents.* The individual constituents of milk flavor are isolated, purified, and identified.

2. *Flavor Formation.* The mechanism of flavor formation in dairy products is determined.

*Washington, D. C.

†Beltsville, Md.

3. *Laboratory Studies.* Basic laboratory procedures are developed for removing undesirable flavors, preserving desirable flavors, and preventing the formation of off-flavors in milk and milk products.

4. *Taste Panels.* Statistically valid sensory tests are developed and correlated with objective tests used to measure changes in the flavor of milk and milk products.

5. *Methods and Instrumentation.* Chemical and physical methods and instrumentation for conducting investigations of milk flavor are developed and improved.

Allergens Investigations

Head: DR. E. J. COULSON*

1. *Incidence of Milk Allergy.* The incidence of allergy to the known proteins of milk is determined.

2. *Isolation and Purification of Milk Allergens.* Allergens from fluid milk are isolated and purified and their homogeneity established by physical, chemical and immunological characterization.

3. *Chemical Groups Responsible.* Specific chemical groups responsible for allergic and immunological reactions are determined.

4. *Deallergenization Methods.* Methods for de-allergenizing milk are determined.

MILK PROPERTIES LABORATORY

Chief: DR. G. C. NUTTING

The Milk Properties Laboratory is concerned with basic studies of the composition of milk, the structure of its components, and interactions among them. Much of the work is directly related to the effects of processing on milk properties. Most of the research relates to the proteins and enzymes of milk.

Isolation and Purification Investigations

Head: DR. J. H. WOYCHIK

1. *Separation Methods.* Means are sought to isolate, purify, and characterize the caseins and whey proteins, lipoproteins, and enzymes and other quantitatively minor "leakage" proteins originating in milk-secreting cells and in the blood-vascular system.

2. *Polymorphism.* Genetic and metabolic polymorphism of the principal milk proteins among breeds and bloodlines is investigated.

*Washington, D. C.

3. *Casein Complexes*. Compositional and structural relationships among casein micelles are sought. Association of ions ("milk salts") with the major protein species in molecular complexes, micelles, and larger aggregates is determined.

4. *Enzyme Effects*. Effects of "natural" proteolytic and other milk enzymes on the properties of milk and its components are studied.

5. *Fat Globule Membranes*. Milk fat globule membranes, both natural and artificial, are investigated to determine their chemical nature and the mechanism whereby emulsions of milk fat are stabilized.

6. *Processing Properties*. Changes in milk properties upon processing (heating, concentrating, drying, freezing) are correlated with the molecular and micellar makeup of the proteins.

Structure and Composition Investigations

Head: DR. W. G. GORDON

1. *Amino Acid Analyses*. Amino acid analyses are made on major and minor milk proteins, including enzymes; on chemically modified proteins; on proteoses and peptones of milk; and on peptides made by selective enzymatic degradation of proteins.

2. *Modification of Pure Proteins*. Selected pure milk proteins are subjected to controlled chemical modification to determine their topochemical behavior and effects on their molecular association in solution.

3. *Primary Structure*. Amino acid sequence is determined on peptides of unusual interest, such as "difference peptides" from genetic polymorphs of milk proteins; and at the ends of the peptide chain of undegraded protein molecules.

4. *Metal-Protein Complexes*. Means are sought for combining iron and other essential nutrients with milk proteins in such fashion that the nutrient is uniformly distributed, is assimilable, and does not sensibly alter milk product properties.

Physical-Chemical Investigations

Acting Head: DR. R. E. TOWNEND

1. *Molecular Structure of Proteins*. Molecules and aggregates of the principal milk proteins and their genetic polymorphs are investigated to determine their secondary and tertiary structure, and this is correlated with their amino acid composition, peptide composition, and amino acid sequence.

2. *Molecular Behavior of Proteins*. Explanations of molecular behavior of milk proteins are sought in terms of their bond types, energy and entropy effects, and local geometry.

3. *Protein Interaction*. The interaction of selected milk proteins with ions and small molecules is studied.

PLANT PRODUCTS LABORATORY

Chief: DR. J. W. WHITE, JR.

The Plant Products Laboratory undertakes investigations on Eastern fruits and vegetables including potatoes, and maple sap and sirup, and also does analytical chemical research on these products as well as on the composition of other agricultural commodities assigned to the Eastern Division. There are five areas of investigation: fruits, potatoes and other vegetables, potato products, maple, and special plants.

Fruit Investigations

Head: DR. C. H. HILLS

1. *Study of Components.* The organic constituents of deciduous fruits are isolated and identified. Components that affect the color, flavor, aroma, and texture of processed fruit products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of fruits and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall material, pigments, and enzymes—is applied to obtain more efficient processing methods and higher-quality fruit products.

3. *Processing Quality.* The influence of variety, cultural practices, mechanical harvesting, and pre-processing treatments on the quality of processed fruit products is studied.*

4. *New Products and Processes.* An extended use of Eastern deciduous fruits is sought through the development of new food products and processes.

5. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Potato and Other Vegetable Investigations

Head: DR. W. L. PORTER

1. *Study of Components.* The individual components of potatoes and other vegetables are isolated and identified. Those components that produce and control the color, flavor, texture, and storage properties of processed products are of particular interest.

2. *Improvement in Processing.* Basic information on the flavor of potatoes and other vegetables and on their constituents—starch, sugars, organic acids, lipids, nitrogenous compounds, cell-wall materials, pigments, and enzymes—is applied in this phase to obtain more efficient processing methods and higher-quality potato and other vegetable products.

3. *Varieties and Cultural and Storage Practices.* The influence of varieties and cultural and storage practices on the quality of potato and other vegetable products is studied.†

*In cooperation with the Crops Research Division, ARS, and with State Experiment Stations.

†In cooperation with the Crops Research and Market Quality Research Divisions, ARS.

4. *Potato-Processing Wastes.* The feasibility of extracting useful substances from potato-processing wastes is studied as a means of reducing environmental pollution.

5. *New Products.* An extended use of Eastern potatoes and other vegetables is sought through the development of new food and industrial products that can be made from them.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation necessary for the conduct of these investigations are developed and improved.

Maple Investigations

Head: DR. J. C. UNDERWOOD

1. *Composition of Sap and Sirup.* The organic constituents of maple sap and maple sugar and sirup are isolated, identified, and quantitatively determined.

2. *Flavor and Color Development.* The mechanism whereby maple sirup forms its flavor and color is determined.

3. *Microbiological Control.* Means are sought for controlling the microorganisms in sap which affect the flavor, color, and production of maple products.

4. *Sap Collection and Sirup Processing.* Collecting and processing techniques are studied in the light of their effect on the quality and uses of finished sirup.

5. *Industrial Processes and Products from Maple.* Improved and extended industrial uses of maple sirup are sought by developing new processes and products.

6. *Methods and Instrumentation.* Physical and chemical methods and instrumentation for the conduct of these investigations are developed and improved.

Potato Products Investigations*

Head: R. L. SHAW, JR.

1. *Varieties and Cultural Practices.* The influence of varieties and cultural factors on the quality of commercial forms of processed potatoes is studied.†

2. *Storage.* The influence of storage environment on the quality of commercial forms of processed potatoes is studied.‡

3. *Composition of New Varieties.* The gross composition of new and experimental potato varieties is related to established processing methods and quality of products.†

4. *Processing Potential of New Varieties.* Laboratory methods are devised and developed to screen new and experimental varieties of potatoes for their processing potential.†

5. *Pilot-Plant Operations.* Integrated pilot plants are planned and operated to accurately foretell the effects of the cultural and varietal factors on a commercial scale.

6. *Product Evaluation.* Products are evaluated by appropriate subjective and objective methods.

*East Grand Forks, Minnesota. Operated in cooperation with the Minnesota and North Dakota Agricultural Experiment Stations and the Red River Valley Potato Growers Association.

†In cooperation with the Crops Research Division, ARS.

‡In cooperation with the Market Quality Research Division, ARS.

Special Plant Investigations

Head: DR. C. L. OGG

1. *Evaluation Methods.* Chemical and physical methods for the evaluation of commodities under investigation in various Laboratories of the Division are developed and improved.

2. *Electronic Instrumentation.* Electronic instrumentation is developed for the conduct of research by the various investigations in the Division.

3. *Flavor Research.* Flavors and flavor precursors in plant products are identified.

4. *Special Analytical Techniques.* Microanalytical, mass spectrometric, and gas chromatographic techniques are applied to products of all Laboratories of the Division.

5. *Collaborative Studies.* Chemical and physical methods are evaluated in collaboration with outside laboratories.

TOBACCO LABORATORY

Chief: DR. C. F. WOODWARD

The Tobacco Laboratory does research on leaf and smoke constituents and on tobacco products aimed at improving their quality and minimizing or eliminating any harmful biological effects that may be associated with smoking. Investigations are conducted on cigar and cigarette smoke, tobacco leaf, leaf processing, and pyrolysis, and special cooperative research is carried on at the University of Kentucky on health-related aspects of smoking.

Smoke Investigations

Head: DR. R. L. STEDMAN

1. *Smoke Quality.* The constituents of smoke that contribute to flavor, aroma, and biological activity are isolated and identified.

2. *Analytical Methods.* Improved methods are developed to isolate and determine components of major organoleptic and biological importance.

3. *Smoke Fractionation.* Constituents and fractions of smoke are prepared for biological evaluation.

4. *Correlation of Smoke Components and Quality.* The composition of smoke is correlated with its flavor, aroma, and physiological characteristics.

Leaf Investigations

Head: DR. O. T. CHORTYK

1. *Leaf Quality.* The leaf constituents responsible for the flavor, aroma, and biological activity of smoke are isolated and identified.

2. *Leaf Composition and Quality.* The relationships between leaf composition and the flavor, aroma, and biological characteristics of smoke are evaluated.

3. *Variations in Tobacco Types.* Differences in constituents of various tobacco types are determined.

4. *Biological Preparations.* Leaf compounds and fractions are prepared for biological tests.

Leaf Processing Investigations

Head: DR. A. I. SCHEPARTZ

1. *Tobacco Fermentation.* The microflora involved in tobacco fermentation are isolated and identified.

2. *Enzymes.* The enzymes elaborated by the principal microflora are determined.

3. *Processing Methods.* Improved methods for processing tobacco leaf are developed.

4. *Processing Treatment and Quality.* The flavor, aroma, and physiological characteristics of tobaccos from various processing treatments are correlated.

Pyrolysis Investigations

Head: DR. I. SCHMELTZ

1. *Pyrolytic Products.* Pyrolytic products of tobacco leaf constituents are determined.

2. *Burn-Temperature Modification.* Tobacco additives are sought that will change the burn temperature.

3. *Smoke Formation.* The basic physico-chemistry of the smoke-forming process is investigated.

4. *Removal of Smoke Constituents.* Techniques are developed to selectively remove constituents.

PHYSICAL CHEMISTRY LABORATORY

Chief: DR. L. P. WITNAUER

The Physical Chemistry Laboratory is concerned with the determination of molecular structures, the development and application of mathematical procedures, the measurement of physical properties, and the investigation of the principles and techniques of separation science. The basic studies are applied to the constituents of and products from hides, fats, milk, meat, and other commodities assigned to the Division.

Molecular Structure Investigations

Head: DR. H. SUSI

1. *Physical Techniques.* Absorption spectroscopy, X-ray diffraction, NMR spectroscopy, and other physical techniques are applied to develop information concerning the inter- and intramolecular structure of the constituents of hides, fats, meat, milk, and other products, and of pertinent model systems.

2. *Experimental and Mathematical Techniques.* Specialized experimental and mathematical techniques are developed and applied for structural studies, such as investigations on isotopically substituted molecules, precise measurements in aqueous solutions, investigations with polarized radiation, and adaptation of recent theoretical advances for solving specific problems.

3. *Relationship Between Structure and Properties.* Inter- and intramolecular parameters, such as hydrogen-bond energies, rotational barriers, molecular force constants, and the form of normal vibrations, as revealed through experimental studies in conjunction with pertinent calculations, are related to the chemical and physical characteristics of the products under investigation.

4. *Collaborative Studies.* Consultations and collaborative studies are carried out involving molecular spectroscopy and molecular structure.

Mathematical Investigations

Head: DR. C. R. EDDY

1. *Calculation of Molecular Data.* Mathematical methods and computer-based procedures are developed for obtaining basic molecular information from experimental measurements to assist research on milk, meat, animal fats, potatoes, tobacco, and hides.

2. *Calculation of Material Properties.* Computer-based procedures are developed for obtaining information on properties of materials above the molecular level from experimental measurements such as dielectric properties, dynamic mechanical behavior, and X-ray diffraction for use in research on animal fats, milk constituents, and hides.

3. *Theoretical Computation of Molecular Properties.* Internal molecular properties not readily accessible to experimental measurements are computed theoretically for application to constituents of, and products from, animal fats, hides, milk, and meat.

4. *Consultations and Service.* Mathematical consultations and general computer services are provided.

Physical Properties Investigations

Acting Head: DR. L. P. WITNAUER

1. *Application of Existing Techniques.* Light scattering, osmotic pressure, ultracentrifugation, electron microscopy, electrophoresis, differential thermal analysis, rheometry, and mechanical, electrical, and other techniques are applied to determine the physical properties of, constituents of, and products from, such commodities as hides, animal fats, milk, and meat.

2. *New Techniques.* Such new techniques and apparatus as electrical birefringence and light scattering in an electric field are developed as needed for basic physical characterization of the constituents of various products.

3. *Evaluation Studies.* Components and derivatives of such products as hides and fats are evaluated through examination of their mechanical and thermal properties and other characteristics important to their potential usefulness as films, fibers, thickeners, and surface-active agents.

4. *Collaborative Studies.* Consultation and collaborative studies are carried out involving physical properties.

Separations and Composition Investigations

Head: DR. H. L. ROTHBART

1. *Separation Techniques.* Chromatography, countercurrent distribution, zone refining, and other separation techniques are studied to develop information about the composition of such products as animal fats, meat, milk, and tobacco.

2. *Principles of Separation Processes.* The basic principles underlying separation processes, including equilibrium and transport phenomena, are determined in order to develop the mathematical representations required to predict efficient separations of components of various products.

3. *New and Improved Separation Procedures.* New and improved methods and instrumentation are developed for the separation of components of various products.

4. *Collaborative Studies.* Consultations and collaborative studies are carried out with other research units on problems in separation science.

ENGINEERING AND DEVELOPMENT LABORATORY

Chief:

N. C. ACETO

The Engineering and Development Laboratory, which originates, evaluates, and develops new processes on a pilot-plant scale, is working in four areas of investigation. Two of these are concerned with new and improved products—food, feed, and industrial—from the animal and plant commodities assigned to the Eastern Division. The other two areas concern the analysis of the properties of the products developed and the design of equipment to make them. As a special staff function, the commercial feasibility of projects proposed or under way is analyzed.

Commercial Feasibility Group

V. A. TURKOT

Pilot-plant research is evaluated before it is undertaken to determine the likelihood of economic success, cost factors are investigated in the course of the research, and large-scale production costs are projected to appraise the commercial potential of processes developed or proposed in the Division.

Animal Products Investigations

Head: H. I. SINNAMON

1. *New and Improved Products.* New and improved products from animal sources are originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and standard equipment best suited to the preparation of the products are determined and the functional requirements for new equipment, where necessary, are established.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering research data.

4. *Advice to Industry.* Plans are developed for semi-works and large-scale processing as a basis for advising industry on the commercialization of developments.

Plant Products Investigations

Head: J. CORDING, JR.

1. *New and Improved Products.* New and improved products from plant sources are originated, evaluated, and developed on a pilot-plant scale.

2. *Methods and Equipment.* The methods and standard equipment best suited to the preparation of the products are determined and the functional requirements for new equipment, where necessary, are established.

3. *Pilot-Plant Operation.* Integrated pilot plants are planned and operated to obtain engineering research data.

4. *Advice to Industry.* Plans are developed for semi-works and large-scale processing as a basis for advising industry on the commercialization of developments.

Product Analysis Investigations

Head: E. S. DELLAMONICA

1. *Chemical and Physical Analysis.* Analytical methods for measuring the chemical and physical properties of products under development in the Laboratory are selected, modified, and applied.

2. *Microbiological Analysis.* Microbiological techniques to assure that newly developed products meet high sanitary standards are improved, developed, and applied.

3. *Sensory Analysis.* Objective and organoleptic procedures are applied to analyze the odor, taste, and texture of food products under development to evaluate their quality, storage characteristics, and end uses.

4. *Evaluation.* The analytical results are evaluated as a guide for engineering pilot-plant experimentation.

Equipment and Design Investigations

Head: W. K. HEILAND

1. *Design Requirements.* The design requirements of processing equipment are determined from experimental data obtained in the pilot plant by other Investigations of the Laboratory.

2. *Specialized Equipment.* Mechanical designs are originated and created for specialized pilot-plant equipment not available commercially for experimental use by the engineering teams.

3. *Modification of Equipment.* Standard equipment units are modified to adapt them to new uses by the engineering research teams.

4. *Scaling Up of Equipment.* Original designs and modifications are projected to a larger scale to adapt them for commercial use.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

Principal Scientist:

DR. S. N. TIMASHEFF*

This Laboratory seeks an understanding, on the most fundamental level, of the structure of biological macromolecules and the relation of this structure to their activity or function. Investigations encompass such problems as determination of the gross and fine structure of proteins and nucleic acids in solution and in the solid state; effects of interactions between macromolecules, as well as between macromolecules and small molecules and solvent components, on the conformation and activity of the macromolecules; effects of mutations and the existence of polymorphism on the biophysical properties of the molecules; and development of new theories and experimental methods that will advance scientific knowledge of biological macromolecules and the nature of their functions.

*Brandeis University, Waltham, Mass.

DIRECTORY

HEADQUARTERS

Eastern Utilization Research
and Development Division

600 E. Mermaid Lane, Wyndmoor, Pa. 19118

215-247-5800

(FTS: 215-247-5, followed by 3-digit Ext. No.)

Room		Phone Extension
3032	Aceto, N. C.	247
3128	Chortyk, O. T.	283
2028	Connor, E. A.	240
3024	Cording, J., Jr.	280
2024	Corrigan, G. A.	241
2206	DellaMonica, E. S.	307
3010	Dryden, E. C.	385
1122	Eddy, C. R.	345
2204	Filachione, E. M.	360
1026	Gaspari, D.	296
1112	Gordon, W. G.	333
3028	Heiland, W. K.	282
3116	Hills, C. H.	270
2019	Krider, M. M.	212
3006	Maerker, G.	244
3122	Mellon, E. F.	363
1036	Moyer, D. B.	205
2000	Naghski, J.	227
1030	Nutting, G. C.	285
1128	Ogg, C. L.	343
3119	Porter, W. L.	322
2034	Ratchford, W. P.	243
2012	Roberts, N. E.	214
1004	Rosenberg, C. H.	215
2118	Rothbart, H.	278
0208	Schepartz, A. I.	336
2110	Schmeltz, I.	350
3008	Scott, W. E.	266
1036	Seibles, T. S., III	310
2130	Silbert, L. S.	249
3015	Sills, M. W.	218
3026	Sinnamon, H. I.	281
3110	Stedman, R. L.	264
3104	Stirton, A. J.	256
1124	Susi, H.	340
1013	Swift, C. E.	225
1125	Townend, R. E.	344
3015	Treadway, R. H.	209
3036	Turkot, V. A.	373
2104	Underwood, J. C.	349
2015	Walens, H. A.	230
3205	Wasserman, A. E.	369
3000	White, J. W., Jr.	231
1205	Windus, W.	217
1032	Witnauer, L. P.	226
2032	Wolff, I. A.	242
3004A	Woodward, C. F.	329
1104	Woychik, J. H.	332
3101	Wrigley, A. N.	229

DAIRY PRODUCTS LABORATORY

South Building, USDA
14th St. & Independence Ave., SW.
Washington, D. C. 20250

202 REpublic 7-4142

To call directly, dial DUdley 8, then extension
(FTS: 202-388, followed by 4-digit Ext. No.)

Room		Phone Extension
0139	Coulson, E. J.	5289
0640	Edmondson, L. F.	5006
0612	Pallansch, M. J.	2484
1655	Webb, B. H.	2364

BELTSVILLE LABORATORIES

(Meat and Dairy Products)
Agricultural Research Center
Beltsville, Md. 20705

301 GRanite 4-4800

(FTS: 202-967-1221; ask for 1234, followed by
3-digit Ext. No.)

Building No.		Phone Extension
157	Alford, J. A.	215
200	Gaddis, A. M.	394
200	Sulzbacher, W. L.	394

POTATO PRODUCTS INVESTIGATIONS

Red River Valley Potato Research Center
P. O. Box 113
East Grand Forks, Minn. 56721

218-773-2473

(FTS: 701-774-6344)

Shaw, R. L.

PIONEERING RESEARCH LABORATORY OF PHYSICAL BIOCHEMISTRY

Graduate Department of Biochemistry
Brandeis University
Waltham, Mass. 02154

617-894-6000, Ext. 547

(FTS ASST.: 617-223-2100)

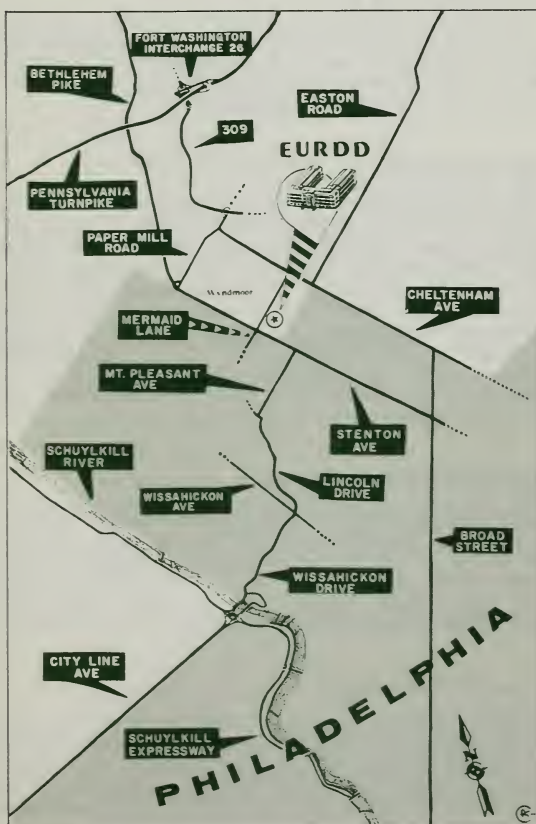
Timasheff, S. N.

HOW TO REACH THE EU LABORATORIES

Wyndmoor, Pa.

By air. The Philadelphia International Airport is about 18 mi. south of the Wyndmoor laboratories. Take taxi or airport limousine to one of the downtown railroad stations given below. To drive, turn right from airport parking lot on Essington Avenue and go 1 mi. to traffic circle. Bear right on Penrose Avenue, following sign to "Center City, Schuylkill Expressway." Continue for 2.3 mi. to 26th Street, then turn left. From here, go 8.7 mi., following Schuylkill Expressway (Interstate 76) to U. S. 1. Instructions for getting to the Laboratories from the expressway are given below.

By car. From the south, approach Philadelphia on U. S. 1 (City Line Avenue) or use Schuylkill Expressway. Leave expressway at City Line Avenue at exit marked "City Avenue Bridge, Germantown, Chestnut Hill." Cross bridge over the Schuylkill River and follow signs to Wissahickon Drive. Proceed on the drive (which becomes Lincoln Drive) for 4.8 mi. to Mt. Pleasant Avenue. Turn right and go 1.3 mi. to Stenton Avenue, then turn left and go 0.9 mi. to Mermaid Lane, then turn right. Laboratories are on the right side of Mermaid Lane, 0.2 mi. from Stenton Avenue.



From the north, east, and west, the point most accessible by car to the Wyndmoor Laboratories is the Fort Washington Interchange of the Pennsylvania Turnpike. From here, follow Pa. 309 south for 2.4 mi. to Paper Mill Road exit. Turn right and go 0.3 mi. to Cheltenham Avenue, then left and go 1.2 mi. to Mermaid Lane, then turn right. Laboratories are on left side of Mermaid Lane 0.9 mi. from Cheltenham Avenue.

By Penn Central Railroad. Take Chestnut Hill train from Philadelphia at Penn Center, 16th Street and Kennedy Boulevard; at 30th Street Station; or at North Philadelphia Station. Laboratories are 1½ mi. from Chestnut Hill Station. Take a taxi or a southbound "L" bus marked "Broad-Olney Subway" to Stenton Avenue and Mermaid Lane and walk left 2 blocks to the Laboratories.

By Reading Railroad. Take Chestnut Hill train from Philadelphia at Reading Terminal, 12th and Market Streets; at North Broad Street Station; or at Wayne Junction. Get off at Wyndmoor. Laboratories are 5 blocks north of station on Mermaid Lane.

By local transportation. Take a Broad Street Subway train to Olney Avenue. Get transfer when paying fare. Transfer to "L" bus marked "Erdenheim" at northwest corner of Broad Street and Olney Avenue. Get off bus at Mermaid Lane and Stenton Avenue, and walk right 2 blocks to the Laboratories.

Washington, D. C.

The Dairy Products Laboratory is located in the South Building of the U. S. Department of Agriculture at 14th Street and Independence Avenue, SW., near the Washington Monument.

Beltsville, Md.

The Meat Laboratory and the pilot plant of the Dairy Products Laboratory are located, respectively, in the Animal Husbandry Administration Building (Bldg. 200) and the Dairy Products Building (Bldg. 157) at the Agricultural Research Center, Beltsville, Maryland. The Center lies between U. S. 1 and the Baltimore-Washington Parkway, about 15 miles northeast of Washington, D. C. It is reached conveniently only by automobile, since it is about 2 miles from the Beltsville stop of the Greyhound and Trailways buses on U. S. 1.

East Grand Forks, Minn.

The Potato Products Investigations are carried on at the Red River Valley Potato Research Center, located on U. S. 202 and 9th Avenue, South, in East Grand Forks, Minnesota. This is just about a mile from the DeMer Bridge crossing the Red River from Grand Forks, North Dakota.

Brandeis University

The Pioneering Research Laboratory of Physical Biochemistry is located in the Graduate Department of Biochemistry at Brandeis University. The Brandeis campus is in Waltham, Massachusetts, about 10 miles west of Boston, 2 miles from Exit 51 on Route 128.

Other Divisions of
MARKETING AND NUTRITION RESEARCH

Agricultural Research Service
U. S. Department of Agriculture

**Northern Utilization Research and Development
Division**

1815 N. University St.
Peoria, Ill. 61604
Phone 309-685-4011
(FTS: Same)
Dr. R. J. Dimler, Director
Cereal grains: corn, wheat, barley, grain
sorghum, and oats; oilseeds: soybean, flax-
seed, and erucic acid-containing oilseeds;
new crops.

**Southern Utilization Research and Development
Division**

1100 Robert E. Lee Blvd. (P.O. Box 19687)
New Orleans, La. 70119
Phone 504-527-7544
(FTS: Same)
Dr. C. H. Fisher, Director
Cotton and cottonseed; pine gum; Southern
fruits and vegetables, including citrus, and
sweet-potatoes; rice; peanuts.

**Western Utilization Research and Development
Division**

800 Buchanan St.
Albany, Calif. 94710
Phone 415-525-2244
(FTS: Same)
Dr. Arthur I. Morgan, Jr., Director
Western fruits (including citrus, other sub-
tropical, and tropical fruits); tree nuts;
vegetables; poultry products; forage crops;
wheat; rice; barley; wool and mohair; dry
beans and peas; castor, safflower, and west-
ern oilseeds.

Richard B. Russell Agricultural Research Center

College Station Road
P.O. Box 5677
Athens, Ga. 30604
Phone 404-546-3152
(FTS: Same)
Southeastern fruits (including citrus, sub-
tropical, and tropical fruits); pecans; vege-
tables; forages and feeds; poultry and
pork; and sunflower, peanuts, and South-
eastern oilseeds.

Consumer and Food Economics Research Division

Federal Center Bldg.
Hyattsville, Md. 20782
Phone 202 DUDley 8-8451
(FTS: Same)
Dr. Florence H. Forziati, Acting Director
Food consumption and use of family re-
sources; nutritional appraisal of foods and
diets; guidelines for food selection; eco-
nomic problems of families.

Human Nutrition Research Division

Agricultural Research Center
Beltsville, Md. 20705
Phone 301 GRanite 4-4800, Ext. 337
(FTS: 202-967-1221; ask for 1234-337)
Dr. Willis A. Gortner, Director
Metabolic effects of diet and nutritional requirements of man; nutritive values of food.

Market Quality Research Division

Federal Center Bldg.
Hyattsville, Md. 20782
Phone 202 DUDley 8-8695
(FTS: Same)
Dr. H. T. Cook, Director
Quality evaluation and measurement and prevention of deterioration and spoilage of agricultural products during storage, transportation, and marketing.

Transportation and Facilities Research Division

Federal Center Bldg.
Hyattsville, Md. 20782
Phone 202 DUDley 8-8721
(FTS: Same)
William C. Crow, Director
Finding ways to hold down the costs of physical distribution of products between farms and consumers by improving marketing facilities, equipment, and methods.

☆ GPO 964-875

NOTES

